Engineering College, Barmer

अभियांत्रिकी महाविद्यालय, बाड़मेर

NH-68, Jalipa Cantt., Jaisalmer Road, Barmer – 344001
www.gecbarmer.ac.in e-mail Id: - principal.gecb@rajasthan.gov.in
GSTIN No.08JDHG16659G1D9

Ref.: ESTT/ECBarmer/2020/1794 Date: 21.10.2020

बिड आमंत्रण

अभियांत्रिकी महाविद्यालय बाड़मेर के निम्नलिखित कार्यों के लिए वित्तीय वर्ष 2020–21 में **Lab equipments and Software's for different labs (Petroleum Engg., Civil Engg., Electrical Engg., Mechanical Engg., Electronics and Communication Engg.)** कार्यों हेतु उपयुक्त पंजीकृत संवेदकों से ई–प्रक्योरमेन्ट प्रक्रिया के अन्तर्गत ऑनलाईन ई–निविदा आमंत्रित की जाती है। महाविद्यालय में विभिन्न लैबों के लिए उपकरण उपलब्ध करवाने हेतु राजस्थान लोक उपापन में पारदर्शिता अधिनियम 2012 एवं राजस्थान लोक उपापन में पारदर्शिता नियम 2013 के वाणिज्यिक कर/जीएसटी विभाग में पंजीकृत ऐसे विनिर्माता(ओं), विक्रेता(ओं), आपूर्तिकर्ता(ओं) जो किसी भी राजकीय संस्थान/उपक्रमों से बोली लगाने से विवर्जित/ब्लैक लिस्टेड नहीं हो, से ई–टेन्डरिंग की प्रक्रिया द्वारा निविदाएं आमंत्रित की जाती है। निविदा की तिथियां, समय व अन्य शर्तें एवं निविदा में सम्पादित करवाए जाने वाले कार्य एवं अन्य विस्तृत विवरण महाविद्यालय की वैब साईट http://www.gecbarmer.ac.in एवं http://www.eproc.rajasthan.gov.in. और राज्य लोक उपापन पोर्टल http://www.sppp.rajasthan.gov.in पर अवलोकन की जा सकती है। उपरोक्त निविदा हेतु नियम एवं शर्तें पोर्टल द्वारा डाउनलॉड कर देखी जा सकती है।

Tender Form Fee – Rs. 500/- per tender (Non Refundable)
RISL Processing Fee – Rs. 1000/- (Non Refundable)
Bid Security – 2 % of the Contract Value (As per Notice Inviting Bid) (Refundable)

S. No.	Subject	Date	Time Upto
1.	Publishing Date	22-10-2020	06:00 PM
2.	Documents Download start date	23-10-2020	09:30 AM
3.	Pre Bid Conference	26-10-2020	03:30 PM
4.	Documents Download End Date	11-11-2020	05:00 PM
5.	Bid Submission Last Date	12-11-2020	05:00 PM
6.	Technical Bid Opening Date	13-11-2020	03:00 PM
7.	Submission of Demand Draft/ Banker Cheque/ Stamps	13-11-2020	10:00 AM

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Ref.: ESTT/ECBarmer/2020/

Date: 21.10.2020

NIT No: - 06/2020-21

NOTICE INVITING BID

Engineering College, Barmer (ECB), Barmer invites bid under Rajasthan Transparency in Public Procurement Act, 2012 & Rules, 2013 for supply/hiring of following goods/services from experienced, technically and financially sound & reputed bidders fulfilling eligibility criteria as described in the bid document as appended below:-

S. No.	"Lab equipments and Software's for different labs" (Petroleum Engg. Civil Engg. Electrical Engg, Mechanical Engg, Electronics and Communication Engg.)	Departments	Approximate Cost (in Rs.)	2% Bid Security Fees (in Rs.)	5% performance Fees (in Rs.)	Tender fee (Non Refundable)
1.	Concrete Lab	Civil Engineering	2200000	110000	44000	500
2.	Surveying & Advance Surveying Lab		500000	25000	10000	500
3.	Fluid Mechanics & Hydraulic Engineering Lab		3000000	150000	60000	500
4.	Environmental Engineering Lab		1200000	60000	24000	500
5.	Transportation Engineering Lab		1600000	80000	32000	500
6.	Materials Testing Lab	Mechanical Engineering	4000000	200000	80000	500
7.	Mechanical Workshop (Production Practice & Basic Mechanical Engineering Lab)		4500000	225000	90000	500
8.	Tom & Vibration Lab		600000	30000	12000	500
9.	Thermal Engineering Lab		2200000	110000	44000	500
10.	Power System Lab	Electrical Engineering	3000000	150000	60000	500
11.	Control System Lab		1000000	50000	20000	500
12.	Electrical Drive Lab		1800000	90000	36000	500
13.	Power System Protection Lab		1000000	50000	20000	500
14.	Drilling Fluids & Cementing Lab	Petroleum Engineering	500000	25000	10000	500
15.	Reservoir Engineering Lab		3000000	150000	60000	500
16.	Petroleum Production Engineering Lab		2000000	100000	40000	500
17.	Petroleum Product Testing Lab		2000000	100000	40000	500
18.	Seperation Process Lab		2000000	100000	40000	500
19.	Antenna Design Lab	E & C Engineering	1200000	60000	24000	500
Total			**37300000**	**1865000**	**746000**	**9500**

BID Terms and Condition

1. The bid documents, terms and conditions for "**Lab equipments & Software's for different labs**" may be seen and downloaded from the web site www.sppp.raj.nic.in, http:// eproc.rajasthan.gov.in and www.gecbarmer.ac.in.
2. The Bids will be opened on the same date and time before procurement committee in the presence of bidder or their authorized representative who may be present.
3. In the event of the specified dates being a holiday, the activities assigned on that date may be carried out on next working day on the same time.
4. Bids received after the prescribed time and date will not be considered.
5. The bidders shall have to submit GST Registration Number along with copy of the same without which the Bids will not be considered.
6. Validity: 90 days from the opening of Technical Bid.
7. In case of any query, the undersigned (Procurement Entity) may be contacted by at 07230845502 or e-mail at principal.gecb@rajasthan.gov.in & info.gecbarmer@gmail.com
8. Corrigendum if any will be published on websites only.
9. The tender document is not transferrable under any circumstances.
10. No physical/ offline bid shall be accepted.
11. Tender shall be submitted online www.gecbarmer.ac.in (Principal Engineering College Barmer) and shall be opened in the same office.
12. The interested bidders shall have to be enrolled/ registered with portal of eproc.rajasthan.gov.in for participating in the bidding process.
13. The bid security shall be in the form of Demand Draft/ Banker cheque/ Bank guarantee of scheduled bank drawn in favour of "Principal, Engineering College, Barmer" payable at Barmer. Processing fees shall be in the form of Demand Draft/ Banker cheque drawn in favour of RISL, Payable at Jaipur and Tender cost should be in form of Demand Draft/ Banker cheque in favour of "Principal, Engineering College, Barmer" payable at Barmer Shall be submitted in the office of Principal, Engineering College Barmer, District Barmer up to schedule date and time up to 10:00 AM failing which Bids shall not be considered.
14. Conditional tenders and causal letter sent by the bidder will not be accepted.
15. The procurement entity reserves the right to cancel the Bid without assigning reason to the Bidder or anyone else.
16. Bidders are requested to read the instructions in the technical document/ Bid before submitting the Bid online.
17. Bidders who are black listed by the Govt. Of India/Any State Govt./Any Union Territory/ State Agency are not entitled to file the tenders.
18. Minors/Lunatic/Insolvents are not eligible to file tenders.
19. Bidders should sign with seal on each page of the tender form.
20. Bidder is not entitled to withdraw his offer once the tender is filed.
21. Bidders shall file Bid duly furnishing the required information as per terms and condition of Bid documents.
22. The law relating to procurement "The Rajasthan Transparency in Public Procurement Act, 2012" (hereinafter called the Act) and the: Rajasthan Transparency in Public Procurement Rules, 2013" (hereinafter called the Rules) under the said Act are available on the website of State Public Procurement Portal http://sppp.raj.nic.in. Therefore, the Bidders are advised to acquaint themselves with the provisions of the Act and the Rules before participating in the bidding process. If there is any discrepancy between the provisions of the Act and the Rules and this Bidding Document, the provisions of the Act and the Rules shall prevail. The Bidders have to comply with the provisions of the Act and the Rules as amended time to time.
23. No Bid shall be withdrawn, substituted, or modified after the last date and time fixed for receipt of bids.

24. The Principal Engineering College Barmer shall not be responsible for any inconvenience in website and no extension in deposit of Bid be allowed for any bidder.

Please Note that –

A) All above mentioned documents duly attested by Notary Public must be submitted unattested copies of such documents will not consider valid.

B) All attested documents must be submitted in Hindi or English language. If the documents are not in Hindi or English, they should be translated in Hindi or English and attested by authorised translator. Translated copy along with copy of original documents must be submitted.

C) Tenders will be liable for outright rejection if :-
   i. Any rates are disclosed in cover-A
   ii. Any discount/ special offers are made in cover-A

D) If the following item/ certificate not submitted the Bid will not be considered responsive.
   i. Bid form Fee, Processing fee and Bid security.

Signature of Bidder with Seal

(A) Technical cover

@ In the fee cover (in PDF/JPG Format)

(a) Scanned copy of DD/Banker's cheque for tender fee in favour of "Principal Engineering College Barmer".

(b) Scanned copy of DD/Bankers Cheque/Bank Guarantee for BID Security in favour of Principal, Engineering College Barmer payable at Barmer. Scanned copy of DD/Banker Cheque for Processing Fee in favour of RISL Payable at Jaipur.

In the Technical document cover (in PDF/JPG format)

Scanned copy (signed & sealed) of the Technical Bid alone with the supporting papers (except BoQ sheet) for evaluation of technical bids.

(b) Financial cover (.xls format)

The bill of quantity (BoQ) must be uploaded after entering the rate/percentage in following BoQ.

S.No.	Schedule No. BoQ	Description of work
1.		Tender for "Lab equipments and Software's for different labs" (Petroleum Engg., Civil Engg., Electrical Engg., Mechanical Engg., Electronics and Communication Engg.

Bidders shall enter name of the firm on BoQ only. Bidders are requested not to edit or change any item or quantity. Rates are to be filled on BoQ (in .xls format) on sheet only.

Note : The financial Bids of only those bidders would be opened and considered who meet the criteria of eligibility.

Signature With seal
of Bidder

Technical Bid Evaluation

Name of the Firm : .....

Technical BID

CHECK - LIST

Documents to be submitted.

S.N.	Particulars	Enclosed Y/N	Page No.
1	Last three year Audited Profit & Loss a/c and Balance sheet (Attested by Notary Public)		
2	Copy of PAN duly attested by Notary Public		
3	Attested copy of registration certificate issued by competent authority duly attested by Notary Public (if required)		
4	Registration copy of GST duly attested by Notary Public		
5	Annexure – A (Compliance with the code of Integrity and No Conflict of Interest.)		
6	Annexure – B (Declaration by the Bidder Regarding Qualifications Declaration by the Bidder)		
7	Annexure – C (Grievance Redressal during Procurement Process)		
8	Annexure – D (Additional Conditions of Contract)		
9	Annexure – E (Affidavit regarding acceptance of terms and condition of tender)		
10	Annexure – F (Terms & Conditions of Contract)		
11	Annexure – G (Agreement Letter)		
12	Annexure – L (Technical Undertaking)		
13	Financial Undertaking		
14	Affidavit regarding not black listed		
15	Experience of supply in the last three years (enclosed order/ certificate- not compulsory)		
16	Copy of Audited income tax return of last three years		

Signature With seal
of Bidder

E-Tender form for "Lab equipments and Software's for different labs"

e-Tender Notice No. .....
Bid Security: Rs ...../-
Name of District .....

1	Name of the firm	
2	Telephone No.	(Off.)_____ (Fax)_____
3	Mobile No. Email ID	
4	Office Address of the Firm	
5	Constitution of the Firm whether Proprietorship/Partnership/Company/ Cooperative Society/ Federation	
a)	In case of Proprietorship Firm	
	Name, Fathers Name and Residential Address of the Proprietor	
b)	In case of Partnership Firm	
	Name, Fathers Name and Residential Address of all the Partners.	
	Note : (Enclose the Registration Certificate from the Registrar of Firms or its attested copy/photocopy of Partnership Deed (Attach separate sheet if space is insufficient).	
c)	In case of Company	
i)	Regd. No. of the Company	
ii)	Name and Address of the Directors of the Company	
6	BANK DETAILS OF BIDDER Banker's Name with Branch Account Type Account Number & Bank IFSC Code	
7	GST No. of the Bidder (Enclose a certificate copy of the same)	
8	PAN No. of the Bidder (Enclose a certificate copy of the same)	
9	Latest GST Return Enclosed	
10	Bid Security of Rs. ...../- deposited vide DD/B.C/B.G No ..... Dated ..... Pay order No. ..... dated ..... drawn on ..... (Name of Bank & Branch)	

Signature of the Bidder with Seal
(Name: .....
(Designation .....

Note :

i. Attach separate sheet for details, where required

ii. In case of authorized representative signing this documents enclose copy of the authority letter.

GENERAL TERMS & CONDITIONS OF BID & CONTRACT

Note: - Bidders should read these conditions carefully and comply strictly while sending their bids.

1.	**"Bids by bona-fide dealers**: - Bids shall be given only by bona-fide dealers in the goods. They shall, therefore, furnish a declaration in the Annexure-B as prescribed in RTPP Rules, 2013.
2.	(i) Any change in the constitution of the firm, etc. shall be notified forth with by the contractor in writing to the Procurement Entity and such change shall not relieve any former member of the firm, etc. from any liability under the contract. (ii) No new partner/partners shall be accepted in the firm by the contractor in respect of the contract unless he/they agree to abide by all its terms, conditions and deposit with the Procurement Entity a written agreement to this effect. The contractors receipt for acknowledgement or that of any partners subsequently accepted as above shall bind all of them and will be sufficient to discharge for any of the purpose of the contract.
3.	**GST Registration Certificate:** - Dealer who is not registered under the GST Act pre vailent in the State where his business is located shall not apply for this BID. The GST Registration certificate shall be submitted without which the tender is liable to reject.
4.	The bidder shall sign the BID form at each page and at the end in token of acceptance of all the terms and conditions of the tender.
5.	Rates shall be written both in words and figures. There should be no errors and over writings. The bidder should mention element of GST separately.
6.	All rates quoted must be FOR and should be include all incidental charges. No cartage and transportation charges will be paid by the procurement entity.
7.	**Validity:** - Tender shall be valid for a period of three months from the date of opening of Technical Bid.
8.	The approved supplier shall be deemed to have carefully examined the conditions, specifications, size, make and drawings, etc., of the goods to be supplied. If he has any doubts as to the meaning of any portion of these conditions or of the specification, drawing, etc., he shall, before signing the contract, refer the same to the Procurement Entity and get clarification.
9.	The contractor shall not assign or sub-let his contract or any substantial part thereof to any other agency.

Signature of Bidder with Seal

10.	**Specifications:-** (i) All article supplied shall strictly conform to the specifications, trade mark laid down in the BID form and wherever articles have been required according to ISI specifications, those articles should conform strictly to those specifications and should bear such marks. **(ii)** The supply of articles marked with asterisk/at **serial number ……., shall** in addition, conform strictly to the approved samples. (iii) **Warranty/Guarantee Clause: -** The bidder would give guarantee that the goods/stores/articles would continue to conform to the description and quality as specified for a period of one year from the date of delivery of the said goods/stores/articles to be purchased and that notwithstanding the fact that the purchaser may have inspected and/or approved the said goods/stores/articles, if during the aforesaid period of one year, the said goods/stores/ articles be discovered not to confirm to the description and quality aforesaid or have determined (and the decision of the Procurement Entity in that behalf will be final and conclusive), the purchaser will be entitled to reject the said goods/stores/ articles or such portion thereof as may be discovered not to conform to the said description and quality, on such rejection the goods/articles/stores will be at the seller's risk and all the provisions relating to rejection of goods, etc., shall apply. The bidder shall if so called upon to do, replace the goods, etc. or such portion thereof as is rejection by the Procurement Entity, otherwise the bidder shall pay such damage as may arise by reason of the breach of the condition herein contained. Nothing herein contained shall prejudice any other right of the Procurement Entity in that behalf under this contract or otherwise. (iv) In case of machinery and equipment also, guarantee will be given as mentioned in clause (iii) above and the bidder shall during the guarantee period replace the parts if any and remove any manufacturing defect if found during the above period so as to make machinery and equipments operative. The bidder shall also replace machinery and equipments in case it is found defective which cannot be put to operation due to manufacturing defect, etc. (v) In case of machinery and equipment specified by the Procurement Entity the bidder shall be responsible for carrying out annual maintenance and repairs on the terms and conditions as may be agreed. The bidder shall also be responsible to ensure adequate regular supply of spare parts needed for a specific type of machinery and equipments whether under their annual maintenance and repairs rate contract or otherwise. In case of change of model he will give sufficient notice to the Procurement Entity who may like to purchase spare parts from them to maintain the machinery and equipments in perfect condition.
11.	**INSPECTION:-** (a) The Procurement Entity or his dully authorized representative shall at all reasonable time have access to the suppliers premises and shall have the power at all reasonable time to inspect and examine the materials and workmanship of the goods/equipments/machineries during manufacturing process or afterwards as may be decided. (b) The tenderer shall furnish complete address of the premises of his office, godown and workshop where inspection can be made together with name and address of the person who is to be contacted for the purpose. In case of those dealers who have newly entered in business, a letter of introduction from their bankers will be necessary.
12.	**Samples: -** Tenders for articles marked within the schedule shall be accompanied by two set of samples of the articles tendered properly packed & signed. Such samples if submitted personally will be received in the office. A receipt will be given for each sample by the officer receiving the samples. Samples if sent by train etc. should be dispatched freight paid and the R/R or G.R. should be sent under a separate registered cover.

Signature of Bidder with Seal

13.	Each sample shall be marked suitably either by written on the sample or on a slip of durable paper securely fastened to the sample, the name of the bidder and serial number of the item, of which it is a sample in the schedule.
14.	Approved samples would be retained free of cost up to the period of six months after the expiry of the contract. The Engineering College, Barmer shall not be responsible for any damage, wear and tear or loss during testing, examination, etc. during the period these samples are retained. The sample shall be collected by the bidder on the expiry of stipulated period. The Engineering College, Barmer shall in no way make arrangements to return the samples. The samples uncollected within 9 months after expiry of contract shall be forfeited by the Engineering College Barmer and no claim for their cost, etc., shall be entertained.
15.	Samples not approved, shall be collected by the unsuccessful bidder. The Engineering College, Barmer will not be responsible for any damage, wear and tear, or loss during testing, examination, etc., during the period these samples are retained. The uncollected samples shall be forfeited and no claim for their cost, etc., shall be entertained.
16.	Supplies when received shall be subject to inspection to ensure whether they conform to the specifications or with the approved samples. Where necessary or prescribed or practical, tests shall be carried out in Engineering College, Barmer laboratories, reputed testing house like Shri Ram Testing House, New Delhi and the like and the supplies will be accepted only where the articles conform to the standard of prescribed specifications as a result of such test.
17.	**Drawl of Samples: -** Incase of tests, samples shall be drawn in four sets in the presence of bidder or his authorized representative and properly sealed in their presence. Once such set shall be given to them, one or two will be sent to the laboratories and/or testing house and the third or fourth will be retained in the officer for reference and record.
18.	**Testing Charges: -** Testing charges shall be borne by the Engineering College Barmer. In case urgent testing is desired to be arranged by the bidder or in case of test result showing that supplies are not up to the prescribed standards or specifications, the testing charges shall be payable by the bidder.
19.	**Rejection:-** (i) Articles not approved during inspection or testing shall be rejected and will have to be replaced by the bidder at his own cost within the time fixed by the Procurement Entity. (ii) If, however, due to exigencies of Engineering College Barmer work, such replacement either in whole or in part, is not considered feasible, the Procurement Entity after giving an opportunity to the bidder of being heard shall for reasons to be recorded, deduct a suitable amount from the approved rates. The deduction so made shall be final.
20.	The rejected articles shall be removed by the bidder within 15 days of intimation of rejection, after which Procurement Entity shall not be responsible for any loss, shortage or damage and shall have the right to dispose of such articles as he thinks fit, at the bidder's risk and on his account.
21.	The bidder shall be responsible for the proper packing so as to avoid damage under normal conditions of transport by sea, rail and road or air and delivery of the material in good condition to the consignee at destination. In the event of loss, damage, breakage or leakage or any shortage the bidder shall be liable to make goods such loss and shortage found at the checking/inspection of the materials by the consignee. No extra cost on such account shall be admissible.
22.	The contract for the supply, can be repudiated at any time by the Procurement Entity, if the supplies are not made to his satisfaction after giving an opportunity to the bidder of being heard and recording of the reasons for repudiation.
23.	Direct or indirect canvassing on the part of the bidder or his representative will be a disqualification.

24.	(i)	**Delivery Period: - The bidder whose tender is accepted shall arrange supplies within a period of 30 days from the date of work order.**
	(ii)	**Extent of quantity – Repeat orders: -** If the orders are placed in excess of the quantities shown in the tender notice, the bidder shall be bound to meet the required supply. Repeat orders for extra items or additional quantities may be placed on the rate and conditions given in the tender. Delivery or completion period may also be proportionately increased. The limits of repeat order shall be as under:- (a) 50% of the quantity of the individual items and 50% of the value of original contract in case of works and; (b) 50% of the value of goods or services of the original contract; (c) If the bidder fails to do so, the Procurement Entity shall be free to arrange for the balance supply by limited tender or otherwise and the extra cost incurred shall be recoverable from the bidder.

	(iii) If the Procurement Entity does not Procure any of the tendered articles or Procures less than the quantity indicated in the tender form, the bidder shall not be entitled to claim any compensation.
25.	**Bid Security (B.S.):-** (a) Tender shall be accompanied by Bid Security of @ 2% of estimated cost of the item, without which tenders will not be considered. The amount should be deposited in either of the following forms in favour of Principal, Engineering College, Barmer:- (i) Bank Draft/Bankers Cheque/Bank Guarantee in specified format of the scheduled Bank. (ii) Bid Security must remain valid 30 days beyond the original or extended validity period (b) **Refund of Bid Security: -** The Bid Security of unsuccessful bidder shall be refunded soon after final acceptance of tender i.e. after deposit of performance security & signing of Agreement. (c) **Partial exemption from Bid Security:** - Firms which are registered with Director of Industries Rajasthan, shall furnish the amount of Bid Security in respect of items for which they are registered as such subject to their furnishing registration certificate in original or Photostat copy or a copy thereof duly attested by any Gazetted Officer from the Director of Industries Rajasthan, at the rate of 0.5% of the estimated value of the tender shown in NIT. (d) The central Government and Government of Rajasthan undertakings need not furnish any amount of Bid Security. However, they shall have to furnish a bid securing declaration as per rule 42 of RTPP Rules, 2013. (e) The Bid Security/Performance Security money deposit lying with the Department/office in respect of other tenders awaiting approval or rejected or on account of contracts being completed will not be adjusted towards Bid Security/Performance Security money for the fresh tenders. The Bid Security may however, be taken into consideration in case tenders are re-invited.
26.	**Forfeiture of Bid Security:-** The Bid Security will be forfeited in the following cases: (a) When bidder withdraws or modifies its bids after opening of bids; (b) When bidder does not execute the agreement if any, after placement of supply/work order within specified time; (c) When the bidder fails to commence the supply of the goods or service or execute work as per supply/work order within the time specified; (d) When the bidder does not deposit the performance security within specified period after the supply/work order is placed; and (e) If the bidder breaches any provision of code of integrity prescribed for bidders specified in the Act and Chapter VI of RTPP rules.
27.	**Performance security** Successful bidder shall submit security deposit at 5% value of tender document mentioned in bid documents as security within seven days of acceptance of Bid in the form of :- i. Demand draft in favour of Principal Engineering College Barmer payable at Barmer district form any scheduled Bank ii. Bank guarantee of a scheduled bank. It shall be got verified from the issuing bank. Other conditions regarding bank guarantee shall be same as mentioned in the rule 42 for bid security. iii. Fixed Deposit Receipt (FDR) of a scheduled bank. It shall be in the name of procuring entity on account of procuring entity shall ensure before accepting the Fixed deposit Receipt that the bidder furnishes an undertaking from the bank to make payment/premature payment of the Fixed Deposit Receipt on demand to the procuring entity without requirement of consent of the bidder concerned. In the event of forfeiture of the performance security, the Fixed Deposit shall be forfeited along with interest earned on such Fixed Deposit. iv. Bid security deposited earlier will be adjustable toward performance Security as per norms. v. If the successful Bidder fails to furnish the security Deposit within the time specified, the Bid security shall stand forfeited besides recovery of consequential losses, if any, sustained by the procuring entity apart from cancellation of award of supply contract and debarring of the Bidder. vi. The Performance security Deposit shall be refunded to the supplier upon successful completion of the agreement and on production of "No Demand Certificate" from the Principal Engineering College Barmer. vii. No Interest will be paid on the performance security by the procuring entity.

(2) (i) Firms registered with the Director of Industries Rajasthan in respect of stores for which they are registered, subject to their furnishing the registration in original from the Director of Industries or a Photostate copy or a copy thereof duly attested by any Gazetted Officer, will be partially exempted from Bid Security money and shall pay Performance Security deposit at the rate of 1% of the estimated value of bid.

(ii)Central Government and Government of Rajasthan Undertakings will be exempted from furnishing Performance security amount. However, they shall have to furnish a performance security declaration as per Rule 75 of RTPP Rules, 2013.

(3) Forfeiture of Performance Security Deposit:- Performance Security amount in full or part may be forfeited in the following cases:-

(a) When any terms and conditions of the contract is breached.
(b) When the bidder fails to make complete supply satisfactorily.
(c) Notice of reasonable time will be given in case of forfeiture of performance security deposit. The decision of the Procurement Entity in this regard shall be final.

(4) The expenses of completing and stamping the agreement shall be paid by the bidder and the department shall be furnished free of charge with one executed stamped counter part of the agreement.

28. **Insurance:-**

(i) The goods will be delivered at the destination godown in perfect condition. The supplier, if he so desires, may be insured the valuable goods against loss by theft, destruction or damage, by fire, flood, under exposure to whether or otherwise viz. (war, rebellion, riot, etc.). The insurance charges will be borne by the supplier and state will not be required to pay such charges, if incurred.

(ii) The articles may also be got insured at the cost of the Purchaser, if so desired by the purchaser. In such cases, the insurance should invariably be with Life Insurance Corporation of India or its Subsidiaries.

29. **Payments:-**

(i) Unless otherwise agreed between the parties, payment for the delivery of the stores will be made on completion of supply satisfactorily and on submission of bill in proper form by the bidder to the Procurement Entity in accordance with GF&AR, all remittance charges will be borne by the bidder.

(ii) In case of disputed items, 10 to 25% of the amount shall be with held and will be paid on settlement of the dispute.

(iii) Payment in case of those goods which need testing shall made only when such tests have been carried out, test results received conforming to the prescribed specification.

(iv) आपूर्ति के पेटे भुगतान हेतु समस्त बिल Principal Engineering College, Barmer के नाम प्रस्तुत किये जाएंगे। सम्बन्धित लेब इन्चार्ज से सामग्री प्राप्ति रसीद प्राप्त होने तथा यह प्रमाण–पत्र दिये जाने पर कि आपूर्ति की गई सामग्री पूर्ण एवं सही हालात में एवं पूर्णतया Specifications के अनुरूप है, प्राप्त कर ली गई है, की पुष्टि उपरान्त ही आपूर्तिकर्ता को भुगतान किया जायेगा।

30. (i) **Liquidated Damages:-** In case of extension in the delivery period with liquidated damages the recovery shall be made on the basis of following percentages of value of Stores which the bidder has failed to supply:-

(1.)

a	Delay up to one fourth period of the prescribed delivery period	2½%
b	Delay exceeding one fourth but not exceeding half of the prescribed period	5%
c	Delay exceeding half but not exceeding three fourth of the prescribed period	7½%
d	Delay exceeding three fourth of the prescribed period	10%

(2.) Fraction of a day in reckoning period of delay in supplies shall be eliminated if it is less than half a day.

(3.) The maximum amount of liquidated damages shall be 10%.

(4.) If the supplier requires an extension of time in completion of contractual supply on account of occurrence of any hindrance, he shall apply in writing to the authority, which has placed the supply order, for the same immediately on occurrence of the hindrance but not after the stipulated date of completion of supply.

(5.) Delivery period may be extended with or without liquidated damages, if the delay in the supply of goods is on account of hindrances beyond the control of the bidder.

31.	**Recoveries: -** Recoveries of liquidated damages, short supply breakage, rejected articles shall ordinary be made from bills. Amount may also be withheld to the extent of short supply, breakages, rejected articles and in case of failure in satisfactory replacement by the supplier along with amount of liquidated damages shall be recovered from his dues and security deposit available with the department. In case recovery is not possible recourse will be taken under Rajasthan PDR Act or any other law in force.
32.	Bidders must make their own arrangements to obtain import license, if necessary.
33.	The Procurement Entity reserves the right to accept any tender not necessarily the lowest, reject any tender without assigning any reasons and accept tender for all or anyone or more of the articles for which bidder has been given or distribute items of stores to more than one firm/supplier.
34.	PENING OF TENDERS Technical Bids will be opened at Engineering College Barmer on ~~09.07.2020~~ 13.11.2020 at 3.00 pm. The Financial Tenders of the qualified Technical only will be considered. Only the successful Bidders in Technical Tenders are eligible to participate in further proceedings. Rate offered by the qualified Technical Bidders will be taken into consideration to arrive at lowest rate offered by the Bidders viz. L1, L2 and soon. a) The Rate accepted is for the supply of contracted quantity in all respects for the Quantity Tendered. Any request for revision of the rate due to price fluctuations in International and Domestic Markets or for any other reason during the contract period will not be entertained and stand rejected. b) After deciding the Lowest Rate by the Tender Committee, the procurement entity reserves the right to place order on one or more Bidder (s) at the lowest rate for any quantity as may be agreed to be supplied by the Bidders on the same terms and conditions for supply of Lab Equipments and software within the time stipulated by the procurement entity. c) If the date fixed for opening of Tenders happens to be Govt. holiday, the tenders filled online will be opened on the next working day at the same time specified above. d) Procurement entity reserves the right to award the tender in full or in part to one or several parties. The decision of the procurement entity is final and binding on the Bidders. e) Procurement entity reserves the right to reject any or all the tenders without assigning any reasons whatsoever and the decision of the procurement entity in this regard is final and Binding on the Bidder and cannot be called into question.
35.	Training for the bidders on the usage of e-Tendering System is also being arranged by RISL on regular basis Bidders interested for training may contact e-Procurement Cell, RISL for booking the training slot.
36.	Bidders are also advised to refer "Bidders manual" available under "Downloads" section for further details about the e-tendering process
37.	The Procurement shall be governed by the Rajasthan Transparency in Public Procurement Act, 2012 and Rules, 2013.

Signature & Seal of the Bidder

FINANCIAL UNDERTAKING

(On Rs. 100/- Non Judicial Stamp Paper duly attested by Notary Public)

I/We have clearly understand all the terms and conditions of the tender and agreement etc. and agree to undertake the supply of **Lab equipments and Software's for different labs** destination specified by Procurement Entity.

I/We shall assure that I/We shall strictly abide by the terms and conditions of the Bid, Agreement and Instructions of Principal Engineering College Barmer from time to time.

I/We shall furnish the prescribed Security Deposit amount of 5% on the total value of the cost of the quantity for supply, within seven (7) days of the acceptance of my/our Bid and enter into agreement. I/We are well aware of the forfeiture clause in the terms and conditions of the tender and my our EMD stand forfeited if I/we fail to furnish the prescribed security Deposit and also enter into agreement within seven (7) days of acceptance of my/our tender and I/we will strictly abide by the terms and conditions etc. as per the agreement. In the event of non-fulfillment of contract by me/us, my/our Security Deposit or any amount available with the Principal Engineering College Barmer are liable to be forfeited, award of supply contract stand cancelled besides blacklisting me/us.

SIGNATURE OF THE BIDDER
NAME :
ADDRESS :
Date :

Annexure 'A'

Compliance with the code of Integrity and No Conflict of Interest

(On Rs. one hundred non judicial stamp paper duly attested by Notary Public)

Any person participating in a procurement process shall-

(a) Not offer any bribe, reward or gift or any material benefit either directly or indirectly in exchange for an unfair advantage in procurement process or to otherwise influence the procurement process;
(b) Not misrepresent or omit that misleads or attempts to mislead so as to obtain a financial or other benefit or avoid an obligation;
(c) Not indulge in any collusion, Bid rigging or anti-competitive behavior to impair the transparency, fairness and progress of the procurement process;
(d) Not misuse any information shared between the procuring Entity and the Bidders with an intent to gain unfair advantage in the procurement process;
(e) Not indulge in any correction including impairing or harming or threatening to do the same, directly or indirectly, to any party or to its property to influence the procurement process;
(f) Not obstruct any investigation or audit of a procurement process;
(g) Disclose conflict of interest, if any; and
(h) Disclose any previous transgressions with any Entity in India or any other country during the last three years or any debarment by any other procuring entity.

Conflict of Interest:-

The Bidder participating in a bidding process must not have a Conflict of Interest.
A Conflict of Interest is considered to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations.

A Bidder may be considered to be in Conflict of interest with one or more parties in a bidding process if, including but not limited to;

a. Have controlling partners/shareholders in common; or
b. Receive or have received any direct or indirect subsidy from any of them; or
c. Have the same legal representative for purpose of the Bid; or
d. Have the relationship with each other, directly or through common third parties, that puts them in a position to have access have to information about or influence on the bid of another Bidder, or influence the decision of the procuring Entity regarding the bidding process; or
e. The bidder participates in more than one bid in a bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the Bidder is involved. However this does not limit the inclusion of the same subcontractor, not otherwise participating as a Bidder, in more than one Bid; or
f. The Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specification of the Goods, Works or Service that are the subject of the Bid; or
g. Bidder or any of its affiliates has been hired (or is proposed to be hired) by the procuring Entity as engineer-in-charge/consultant for the contract.

Date:
Place:

Signature of bidder
Name:
Designation:
Address:

Annexure 'B'

Declaration by the Bidder regarding Qualifications

Declaration by the Bidder

(On Rs. one hundred non judicial stamp paper duly attested by Notary Public)

In relation to my/our Bid submitted to .....for procurement of .....in response to their Notice Inviting Bids No.....Dated .....I/We hereby declare under Section 7 of Rajasthan Transparency in Public Procurement Act, 2012, that:

1. I/We possess the necessary professional, technical, financial and managerial resources and competence required by the Biding Document issued by the Procuring Entity;
2. I/We have fulfilled my/our obligation to pay such of the taxes payable to the union and the State Government or any local authority as specification in the Bidding Document;
3. I/We have not insolvent in receivership, bankrupt or being wound up, not have my/our affairs administrated by a court or a judicial officer, not have my/our business activities suspended and not the subject of legal proceeding for any of the foregoing reasons;
4. I/We do not have, and our directors and officers not have, been convicted of any criminal offence related to my/our professional conducted or the making of false statement or misrepresentations as to my/our qualifications to enter into a procurement contract within a period of three years preceding the commencement of this procurement process, or not have been otherwise disqualified pursuant to debarment proceeding;
5. I/We do not have a conflict of interest as specification in the Act, Rules and the bidding Document, which material affects fair competition;

Date:
Place:

Signature of bidder
Name:
Designation:
Address:

Annexure 'C'

Grievance Redressal during Procurement Process

The designation and the address of the first Appellate Authority is **BoG Chairman Engineering College Society Bikaner.**

The designation and the address of the Second Appellate Authority is **Joint Secretary, Technical Education, Government of Rajasthan, Jaipur.**

(1) Filing an appeal

If any bidder or prospective bidder is aggrieved that any decision, action or omission of the Procuring Entity is in contravention to the provisions of the act or the rules or the Guidelines issued there under, he may file an appeal to First Appellate Authority, as specified in the Bidding Document within a period of ten days from the date of such decision or action, omission, as the case may be, clearly giving the specific ground or grounds on which he feels aggrieved:

Providing that after the declaration of a Bidder as successful the appeal may be filled only by a Bidder who has participated in procurement proceeding:

Providing further that in case a Procuring Entity evaluates the Technical Bids before the opening of the Financial Bids, an appeal related to the matter of Financial Bids may be filled only by a Bidder whose Technical Bid is found to be acceptable.

(2) The officer to whom an appeal is filed under Para (1) shall deal with the appeal as expeditiously as possible and shall endeavor to dispose it of within thirty days from the date of the appeal.

(3) If the officer designated under Para (1) fails to dispose of the appeal filed within the period specified in Para (2), or if the Bidder or prospective bidder or the Procuring Entity is aggrieved by the order passed by the Procuring Entity, as the case may be, may file a second appeal to Second Appellate Authority specified in the Bidder Document in this behalf within fifteen days from the expiry of the period specified in Para (2) or of the date of receipt of the order passed by the First Appellate Authority, as the case may be.

(4) Appeal not to lie in certain cases

No appeal shall lie against any decision of the Procuring Entity relating to the following matters, namely:-

(a) Determination of need of procurement;
(b) Provisions limiting participation of Bidders in the Bid process;
(c) The decision of whether or not to enter into negotiations;
(d) Cancellation of a procurement process;
(e) Applicability of the provisions of confidentiality.

(5) Form of Appeal

(a) An appeal under Para (1) or (3) above shall be in the annexed Form along with as many copies as there are respondents in the appeal.
(b) Every appeal shall be accompanied by an order appealed against, if any, affidavit verifying the facts stated in the appeal and proof of payment of fee.
(c) Every appeal may be presented to First Appellate Authority or Second Appellate Authority, as the case may be, in person or through registered post or authorized representative.

(6) Fee for Filling Appeal

(a) Fee for first appeal shall be two thousand five hundred and for second appeal shall be rupees ten thousand, which shall be non refundable.
(b) The fee shall be paid in the form of bank demand draft or banker's cheque of a Scheduled Bank in India payable in the name of Appellate Authority concerned.

(7) **Procedure for disposal of appeal**

(a) The First Appellate Authority or Second Appellate Authority, as the case may be upon filing of appeal, shall issued notice accompanied by copy of appeal, affidavit and documents, if any, to the respondents and fix date of hearing.

(b) On the date of fix hearing, the First Appellate Authority or Second Appellate Authority, as the case may be shall,-

(i) Hear all the parties to appeal present before him; and

(ii) Peruse or inspect documents, relevant records or copies thereof relating to the matter.

(c) After hearing the parties, perusal or inspection of documents and relevant records or copies thereof relating to the matter, the Appellate Authority concerned shall pass an order in writing and provide the copy of order to the parties to appeal free of cost.

(d) The order passed under sub-clause (c) above shall also be placed on the State Public Procurement Portal.

FORM No. 1
(See rule 83)
Memorandum of Appeal under the Rajasthan Transparency in Public Procurement Act, 2012

Appeal No ..... of .....

Before the ..... (First/ Second Appellate Authority)

1. Particulars of appellant:
   i. Name of the appellant:
   ii. Official address, if any:
   iii. Residential address:
2. Name and address of the respondent(s):
   i.
   ii.
   iii.
3. Number and date of the order appealed against and name and designation of the officer/ authority who passed the order (enclose copy), or a statement of a decision, action or omission of the procuring entity in contravention to the provisions of the Act by which the appellant is aggrieved:
4. If the Appellant proposes to be represented by a representative, the name and postal address of the representative:
5. Number of affidavits and documents enclosed with the appeal:
6. Grounds of appeal :

   .....
   .....
   .....
   ..... (Supported by an affidavit)
7. Prayer:

   .....
   .....
   .....

Place .....

Date .....

Appellant's Signature

Additional Conditions of Contract

1. **Correction of arithmetical errors**

Provided that a Financial Bid is substantially responsive, that Procuring Entity will correct arithmetical errors during evaluation of Financial Bids on the following basis:

i. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quality, the unit price shall prevail and the total price shall be corrected, unless in the opinion in the Procuring Entity there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

ii. If there is a error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

iii. If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case in the amount in figures shall prevail subject to (i) and (ii) above.

iv. If the Bidder that submitted the lowest evaluated Bid does not accepted the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited or its Bid Securing Deceleration shall be executed.

2. **Procuring Entity's Right to vary Quantities.**

(i) At the time of award of contract, the quantity of Goods, works or services originally specified in the Bidding Document may be increased or decreased by a specified percentage, but such increase or decrease shall not exceed twenty percent, of the quantity specified in the Bidding Document. It shall be without any change in the unit price or other terms & conditions of the Bid and the conditions of contract.

(ii) If the Procuring Entity does not procure any subject matter of procurement or procures less than the quantity specified in the Bidding Document due to change in circumstances, the Bidder shall not be entitled for any claim or compensation except otherwise provided in the Conditions of Contract.

(iii) In case of procurement of Goods or services, additional quantity may be procured by placing a repeat order on the rates and conditions of the original order. However, the additional quantity shall not be more than 25% of the value of Goods of the original contract and shall be within one month from the date of expiry of last supply. If the Supplier fails to do so, the Procurement Entity shall be free to arrange for the balance supply by limited Bidding or otherwise and the extra cost incurred shall be recovered from the Supplier.

3. **Dividing quantities among one than more Bidder at the time of award (In case of procurement of Goods)**

As a general rule all the quantities of the subject matter of procurement shall be procured from the Bidder, whose Bid is accepted. However, when it is considered that the quantity of the subject matter of procurement to be procured is very large and it may not be in the capacity of the Bidder, whose Bid is accepted, to deliver the entire quantity or when it is considered that the subject matter of procurement to be procured is of critical and vital nature, in such cases, the quantity may be divided between the Bidder, whose Bid is accepted and the second lowest Bidder or even more Bidders in that order, in a fair, transparent and equitable manner at the rates of the Bidder, whose Bid is accepted.

Date:
Place:

Signature of bidder
Name:
Designation:
Address:

ANNEXURE 'E'

Affidavit regarding compliance to Terms & Condition of Tender

(On Rs. 100/- non Judicial stamp paper duly attested by Notary Public)

Bidder Name: .....

I/We confirm that I/We are authorized to submit tender on behalf of the firm participating in the tender and have perused the entire Bid/tender document including all its amendments till date.

Having perused the subject tender with all amendments (wherever applicable). I/We hereby confirm unconditional acceptance and compliance to abide by all its terms & conditions as mentioned in Bid/Tender document including technical particulars, Detailed technical specifications of the product, Special Terms & Conditions and General Terms & Conditions wherever indicated, offer validity, terms of delivery without any deviations whatsoever:

I/We also confirm acceptance of the all General Terms & Condition of tender document.

I/We certify that the prices quoted against the tender are competitive and without adopting any unfair/ unethical means in including cartelization.

I/We certified that tendering firm has not been banned by any Government Department of the State / PSU from business dealings.

I/We also certified that the information given above is factually correct, true and nothing material has been concealed.

Name of Bidder with Signature
and Seal

निविदा की शर्तें एवं निर्देश :–

1- निविदा प्रपत्र के साथ चैक लिस्ट के अनुसार सभी दस्तावेज प्रस्तुत करना अनिवार्य है। अन्यथा निविदा स्वीकार नहीं की जाएगी।

2- बिड स्वीकार होने पर बिडदाता को Principal Engineering College Barmer के साथ अनुबन्ध करना होगा।

3- कार्यादेश एवं कार्यालय द्वारा जारी अन्य सभी आदेशों में आरटीपीपी एक्ट 2012 एवं नियम 13 एवं तत्समय प्रचालित सभी नियमों/ कानूनों तथा विभागीय निर्देशों की पालना की जाएगी।

4- विवाद की स्थिति में न्याय क्षेत्र बाड़मेर जिला मुख्यालय होगा।

5- बिडदाता द्वारा प्रस्तुत दरों में राज्य सरकार द्वारा अधिरोपित सभी करों की राशि सम्मिलित होगी।

6- बिड में अंकित नियम एवं शर्तें, चैक–लिस्ट का भाग माना जाएगा जिसकी आपूर्तिकर्ता को पालना करनी होगी।

7- बोली आमंत्रण में अंकित वस्तु की आपूर्ति हेतु सफल बिडदाता को बोली स्वीकृत आदेश पत्र की दिनांक से अधिकतम 7 दिन में वस्तु प्रदाय आदेश की रकम की पांच प्रतिशत राशि कार्य सम्पादन प्रतिभूति के रूप में डिमाण्ड ड्राफ्ट/ बैंकर्स चैक Principal Engineering College Barmer के नाम पर जमा करानी होगी एवं उक्त आदेश की रकम अनुसार सफल बिडदाता को उसके खर्चे पर विर्निदिष्ट मूल्य के न्यायिकेतर स्टाम्प पर करार निष्पादित करने के लिए कहा जाएगा।

8- Bidder must be a manufacturer, distributer or bonafide dealer in the goods and it shall furnish necessary proof for the same. Proof of authorisation by the manufacturer or country distributer in India, shall be enclosed.

9- बिडर द्वारा प्रस्तुत की गई ई–बिड में समस्त पृष्ठों की संख्या अंकित करते हुए संदर्भित दस्तावेजों का विवरण पृष्ठ संख्या सहित अंकित करना होगा।

10- Bidder shall submit their offer online in electronic format both for technical and financial proposals; however DD/ Banker cheque for tender fee; processing fee, Bid security and non-judicial stamps should be submitted manually in the office of tendering authority.(Principal Engineering College, Barmer) before scheduled date & time as mentioned in NIB. Scanned copy of DD/ Banker Cheque should be uploaded along with the online Bid.

11- Before electronically submitting the BID it should be ensured that all the BID papers including terms & conditions of contract are digitally signed by the Bidder.

12- वित्तीय बिड खोलने से पूर्व बिडदाताओं को आवश्यकतानुसार डेमो (Demo) देने के लिए कहा जा सकेगा।

13- मूल्यांकन में समस्त लागत और केन्द्रीय/राज्य सरकार/स्थानीय प्राधिकारी की विधि के अनुसार बोली लगाने वाले पर लागू समस्त कर एवं शुल्क सम्मिलित होगे।

14- मैं/हम ..... द्वारा जारी की गई ई–बिड सूचना संख्या ..... दिनांक में वर्णित समस्त शर्तों एवं संलग्न पत्रों (जिसके समस्त पृष्ठों पर हमने उसमें वर्जित शर्तों की स्वीकृति के प्रमाण स्वरूप हस्ताक्षर कर दिए है) मैं/हम दी गई समस्त शर्तों से बाध्य होना स्वीकार करते है। बिड की शर्तों के अन्तर्गत बिड में वर्णित कार्यों को पूर्ण करने हेतु मेरे/हमारे पास समस्त सुविधाएं/संसाधन उपलब्ध है।

15- निविदादाता द्वारा यह प्रमाण–पत्र 50/– रू. के नॉन–ज्यूडिसियल स्टाम्प पर सलंग्न करना आवश्यक है। "मेरे/हमारे द्वारा बिड के साथ संलग्न किये गये समस्त दस्तावेजो की प्रमाणिकता की जांच मेरे/हमारे द्वारा अपने स्तर पर कर ली गई है। सभी दस्तावेज विधिक/प्रक्रियात्मक/मौलिक रूप से सही है। यदि बिड प्रक्रिया के दौरान किसी भी स्तर पर उक्त दस्तावेजो की प्रमाणिकता असत्य सिद्ध होती है तो इसके लिए मैं/हम पूर्ण रूपेण उतरदायी रहूंगा/रहेंगे। एवं इसके लिए विभाग किसी भी स्तर पर किसी भी समय बिना नोटिस दिये हमारी बिड/अनुबंध को निरस्त करने/हमारे विरूद्ध कानून/विधि सम्मत दण्डात्मक कार्यवाही करने के लिए सक्षम होगा।"

SR FORM-17

AGREEMENT

(See Rule 68)

An agreement made this _____ day of _____ between _____ (hereinafter called "the approved supplier", which expression shall, where the context so admits, be deemed to include his heirs successors, executors and administrators of the one part and the Government of the of Rajasthan (herein after called "the Government" which expression shall, where the context so admits, be deemed to include his successors in office and assigns) of the other part.

2. Whereas the approved supplier has agreed with the Government to supply to the _____ of the State of Rajasthan at its Head Office as well as at branches offices throughout Rajasthan, all those articles set forth in the schedule appended hereto in the manner set forth in the conditions of the tender and contract appended herewith and at the rates set forth in column _____ of the said schedule.

3. And whereas the approved supplier has deposited a sum of Rs. _____ in _____.

(1) Cash/Bank Draft/Challan no./Banker Cheque No. _____ Dated _____

(2) Post Office Savings Bank Pass Book duly hypothecated to the Departmental authority.

(3) National Savings Certificates/Defence Savings Certificates, Kisan Vikas Patras, or and other script/instrument under National Saving Schemes for Promotion of small Savings. if the same can be pleased under the relevant rule. (The certificates being accepted at surrender value) as security for the due performance of the aforesaid agreement which has been formally transferred to the departmental authority.

4. Now these Presents witness :

(1) In consideration of the payment to be made by the Government through _____ at the rates set forth in the Schedule hereto appended the approved supplier will duly supply the said articles set forth in _____ and _____ thereof in the manner set forth in the conditions of the tender and contract.

(2) The conditions of the tender and contract for open tender enclosed to the tender notice No. _____ dated _____ and also appended to this agreement will be deemed to be taken as part of this agreement and are binding on the parties executing this agreement.

) Letters Nos. _____ received from tenderer and letters nos_____ issued by the Government and appended to this agreement shall also form part of this agreement.

(4) (a) The Government do hereby agree that if the approved supplier shall duly supply the said articles in the manner aforesaid observe and keep the said terms and conditions, the Government will through _____ pay or cause to be paid to the approved supplier at the time and the manner set forth in the said conditions. the amount payable for each and every consignment.

(C) The mode of payment will be as specified below :-

1. _____
2. _____
3. _____

5. The delivery shall be effected and completed within the period one month from the date of supply order.

6. (1) (i)**Liquidated Damages:-** In case of extension in the delivery period with liquidated damages the recovery shall be made on the basis of following percentages of value of Stores which the bidder has failed to supply:-

A	Delay up to one fourth period of the prescribed delivery period	2½%
B	Delay exceeding one fourth but not exceeding half of the prescribed period	5%
C	Delay exceeding half but not exceeding three fourth of the rescribed period	7½%
D	Delay exceeding three fourth of the prescribed period	10%

Note : i) Fraction of a day in reckoning period of delay in supplies shall be eliminated if it is less than half a day.

ii) The maximum amount of liquidated damages shall be 10%.

iii) If the supplier requires an extension of time in completion of contractual supply on account of occurrence of any hindrance, he shall apply in writing to the authority, which has placed the supply order, for the same immediately on occurrence of the hindrance but not after the stipulated date of completion of supply.

(2) Delivery period may be extended with or without liquidated damages, if the delay in the supply of goods is on account of hindrances beyond the control of the bidder.

7. All disputes arising out of this agreement and all questions relating to the interpretation of this agreement shall be decided by the Government and the decision of the Government shall be final.

In witness whereof the parties hereto have set their hands on the ..... day of 2020

Signature of the approved supplier
Signature for and on behalf of Governor
Designation

Date :
Witness No. 1
Witness No. 2

Date :
1. Witness
2. Witness

ANNEXURE 'L'

TECHNICAL UNDERTAKING

I/We have clearly understood all the terms and conditions of the tender and agreement etc. and agree to undertake the supply of **Lab equipments and Software's for different labs** at the rate quoted by me/us at the destinations specified by procurement entity and as per the annexure of Bid document specifications prescribed by the Principal Engineering College Barmer.

I/We shall assure that I/We shall strictly abide by the terms and conditions of the Tender etc. and the instructions issued by the Principal Engineering College Barmer from time to time.

I am/we are enclosing the following documents as per the terms and Conditions of the Bid:

1. Demand Draft bearing No. ..... Dt ..... Rs .....
2. Affidavit attested by a notary to that effect that the Bidder has no past or present criminal record with the police/Vigilance of CS Dept./vigilance And Enforcement Dept. Govt. of Rajasthan or Govt. of any other state/Govt. of India.
3. Affidavit stating that the tendered or any of the partners or Representatives were never black listed by Central Government/ any State Govt./ any union Territory/ State Agency.
4. Copy of the Registration Certificate, if it is firm.
5. Copy of Registration Certificate under GST.
6. Copies of the audited Income Tax returns for last three years.
7. We agree to permit the procuring Entity or its representative to the bid submission and to have then audited by auditors appointed by the procuring Entity.

I/We hereby affirm that procurement entity is at liberty to take action against me/ us as per the terms and conditions of Bid Document, if the above said statement proves to be wrong at any point of time.

Name/address :) _____

In the capacity of: _____

Signed: _____

Duly authorized to sign the bid for and on behalf of _____ Date _____

SIGNATURE OF THE TENDERER
NAME :
ADDRESS :

Technical specifications of different departments Labs are enclosed in details as follows:

1. Concrete Lab					
S.N.	**Items Name**	**Specification**	**Qty.**	**Unit Price**	**Total Price included GST**
1.	**Concrete Moulds** 1.1 Concrete Cubes: 50 mm size	The Moulds shall be conforming to **IS 10086:1982**specifications. These are used for casting cement concrete test specimens for carrying out compressive strength tests as per **IS : 516**. These moulds are manufactured as per IS specifications. It shall be made of cast iron.	**15**		
	1.2 Concrete Cubes: 100 mm Size	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**06**		
	1.3 Concrete Cubes: 150 mm Size	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**30**		
	1.4 Concrete Cubes: 150 mm Size with 3 Mould compartment	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**10**		
	1.5 **Cylindrical moulds**	The Moulds shall be of 150 mm diameter and 300 mm height conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**06**		
	1.6 **Beam moulds** 100 x 100 x 500 mm	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**10**		
	1.7 **Beam moulds** 150 x 150 x 700 mm	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**10**		
	1.8 **Bar moulds** (Autoclave test) 25 x 25 x 250 mm	The Moulds shall be conforming to **IS 10086:1982** specifications. It shall be made of cast iron.	**10**		
	1.9 Mould of 75 x 75 mm me and 150 to 300 mm length	The Moulds shall be conforming to **IS 10080:1982** specifications. It shall be made of cast iron.	**10**		
	1.10Mould for Cement test 70.6 mm Cubes (face area should be 50 cm^2)	The Moulds shall be conforming to **IS 10080:1982** specifications. It shall be made of cast iron.	**30**		
2.	**Accessories 2.1 Tamping rod type-1**	As per **IS: 10086-1982**, the tamping rod shall be 16±0.5 mm dia and 600±2 mm long with a rounded working end and shall be made of mild steel.	**05**		
	2.2 Tamping rodtype-2	As per **IS:10086-1982**, Of square section with tamping face 25 ± 0'5 mm square and 400 ± 2 mm long and weighing 2 kg shall	**03**		

		be made of mild steel and provided with a handle.			
	2.3 Gauging Trowel	The gauging trowel shall be made of mild steel and shall be in accordance **IS: 10086-1982**. The trowel blade shall be of minimum thickness 1.5 mm and of length 195 mm and shall be provided with a wooden handle. The gauging trowel shall weigh 210 ± 10 g.	**05**		
	2.4 Trowel	The trowel shall be made of mild steel and shall be in accordance with **IS: 10086-1982**. The trowel blade shall be of minimum thickness 1.5 mm and 100 to 150 mm length with straight edges.	**05**		
	2.5 Graduated glass cylinder	Graduated glass cylinders of 150 to 200 ml capacity. The permissible variation on these cylinders shall be ± 1 ml. The main graduation lines of the cylinders shall be in circles and shall be numbered. The least graduations shall extend at least one seventh of the way around, and, intermediate graduations shall extend at least one-fifth of the way around the cylinder. The graduation lines may be omitted for the lowest 5 ml.	**05**		
3.	**Cement**				
	3.1 Fineness test apparatus Blaine air permeability apparatus	Parts and accessories of Apparatus shall be conforming to **IS: 5516-1996** specifications. The apparatus should be consist of Permeability Cell, Perforated Disc, Plunger, Filter Paper Discs, U-tube manometer and the filter paper disc cutter and air evacuating rubber bulb may be supplied as accessories.	**02**		
	3.2 Vicat Apparatus, With Dashpot	Vicat Apparatus, with Dashpot Confirming to IS 5513-1976 The equipment should comprise of the following:- i) A frame with a vertically movable rod having a cap at the top ii) Vicat mould in the form of frustum of a cone with internal diameter of 60 mm at the topo, 70 mm at the bottom and a height of 40 mm iii) Glass base plate for the mould iv) Initial setting time needle v) Final setting time needle Consistency plunger Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**05**		
	3.3 Le Chatelier Mould	**Conforming IS : 5514-1969** The apparatus should consist of the following :- i) One split cylinder 30 mm dia x 30 mm high made of spring	**05**		

		brass with two indicator arms. ii) Two glass plates. iii) One lead weight approximately 100 g.			
	3.4 Le Chatelier Water Bath.	Le-Chatelier Water Bath with Controller size 18"x12"x12", made of stainless steel, complete with removable rack to hold 12 moulds. The temp. is thermostatically conttolled and is indicated on a digital display	**03**		
	3.5 Cement Autoclave IS : 4031-1968	Cement Autoclave IS: 4031-1968 Special Features: • Rustproof stainless-steel pressure vessel & enclosure • Microprocessor based PID controller for accurately controlling the temperature hence pressure • Three-fold safety mechanism for the equipment & the operator • Reliable silicon rubber lid sealing gasket • Very Compact • The equipment is supplied with NABL calibrated Pressure Gauge The Equipment should comprise of : i. One high pressure steam chamber approximately 150 mm ID x 600 mm long made of seamless stainless steel tube with bolted steel cover, which should be enclosed in heat insulated metal housing. ii. Strip heaters with thermostat regulator and two heat-switches to regulate rate of heating. iii. Preset pressure switch to control and maintain preset steam. Cm pressure iv. Spring loaded safety valve incorporated in the unit with valve adjusted to work at 23 kg/sq cm pressure approximately. v. Steam pressure Gauge with maximum capacity of 42 kg/sq. cm. vi. A blower for accelerated cooling of the unit at the end of a test vii. One test bar holder for holding eight test specimens inside the steam chamber in vertical position. Specification : 2 Working Pressure : 21 ± 1kg / cm at 215° C Pressure Vessel : ID 150mm X Depth 500 mm Weight : 70 Kg Heater : 2000 Watts Size : 480 (W) x 580 (D) x 1100 (H) Supply : 220V, 50Hz, 1 phase Supplied complete with Standard Accessories: Shrinkage Bar Mould (Single) IS: 4031-1968, 2386 (Part VII) 1963, IS: 10086-1982, ASTM C-151 Length Comparator: IS : 4031-1968, IS: 9459-1980 The apparatus should comprise of the following: • One frame consisting of one base plate, two pillars and a cross-bar. The cross bar should be adjustable up and down on the htreaded pillars. • One dial guage, lest count 0.002 mm, travel 5 mm which can be fixe to the cross bar. The plunger of the dial gauge has a concave spherical seatng which sits over the reference	**02**		

		studs of specimen bars while taking observatkon. One reference bar of stainless steel with insulated handle. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
	3.6 Vibrating Machine Conforming to IS:10080-1982	Vibrating Machine IS:10080-1982 Vibration Machine, with built-in Digital Timer, NABL Calibrated Ref. Standard - IS:4031, IS:10080, EN 196-1 413-2, EN 13454-2 It should be designed Vibration Machine is used for vibrating the mix in moulds at a frequency of 12,000 ± 400 cycles per minute, as per specifications. Machine is used for vibrating the mix in moulds at a frequency of 12,000 ± 400 cycles per minute The Vibrator is mounted over coiled springs and the vibrations are developed by means of a revolving eccentric shaft. The centre of gravity of the vibrator, including the cube and mould, is either at the centre of the eccentric shaft or within 25mm below it. The simple design of the machine facilitates easy assembly and dismantling of the cube moulds. Each machine is supplied with one cube mould with ISI Certification Mark and poking rod. Suitable for operation on 220V, 50Hz, Single Phase, AC supply	**01**		
	3.7 Le-Chatelier's Flask	Flask shall be conforming to IS: 4031 part-11 specification.	**05**		
	3.8 Standard Cone Apparatus for Determination of consistency of masonry mortar	Standard Cone Apparatus **IS:2250-1981** Used for the determination of consistency of masonry mortar. It consists of the following:- A standard cone 75 mm base dia x 150 mm high with a bearing rod. Total weight 300 ± 2 g. A conical container 150 mm dia at top and 180 mm deep. A platform for the container. Penetration measuring apparatus comprising a base with an upright bearing rod carrying a vertically adjustable bracket. The bearing rod of the Standard Cone passes through the lower bracket arm which houses a clamping and release mechanism. The upper bracket arm carries a dial, graduated to read 1/10th of a mm and a rack and pinion arrangement with a pointer. A 25 mm square tamping bar 200 mm long.	**01**		

	3.9 Tensile Strength Tester	Tensile Strength Tester, Hand Operated **BS:12, IS : 269-1958** Used for estimation of tensile strength of cement briquettes. The equipment comprises the following :- A loading machine, double lever type, with a steel scale marked from 0 to 500 Newtons in 10 Newton division. Maximum loading capacity 5 kN. Automatic loading system using lead shot. Lead shot 15 kg. Set of weights for weighing lead shot comprising one each for weighing upto 0.5 kN, 1 kN, 1.5 kN and 2 kN. One standard briquette mould with base plate	**01**		
4.	**Hot Air oven**	Hot Air oven (Inside Chamber stainless steel) with digital temperature controller and air circulating fan size: 18" x18"x18" Laboratory Electric Oven, with Digital Indicator Cum Controller with Safety Alarm, range 50° to 250°C +/-1°C with Air Circulating Fan, S.S. Inside Size 450 x 450 x 450mm Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**02**		
5.	**Equipment for test on Aggregates**				
	5.1 Particle size & shape test (a)Thickness Gauge (b) Length Gauge	Moulds specification shall be conforming to **IS: 2386 Part-I-1963.** (a) It consist of a panel having accurately cut slots of different standard lengths and widths. (b) It consist of a metal plate on which 8 steel pins are vertically mounted with specified distances in between and it is mounted on a hardwood stopper.	**05 each**		
	5.2 Mould for Angularity Number test	A metal cylinder closed at one end and of about 3 litre capacity, the diameter and height of this being as 15.64 cm dia x 15.64 height.	**02**		
	5.3 Apparatus for measuring Bulk density, void of	**IS:2386 (Part-III)-1963, IS:10079-1982** (i) Cylindrical Metal Measure- The measure shall preferably be machined to accurate internal dimensions and shall be provided with handles. It shall also be	**02 each**		

	aggregate.	watertight, and of sufficient rigidity to retain its form under rough usage, and should be protected against corrosion. Three calibrated cylindrical measures one each of **3 litre, 15 litre and 30 litre** capacity made out of steel sheet with handles, complete with one tamping rod 16 mm dia x 60 cm long rounded at one end.			
	5.4 Density Basket	Density Basket **IS : 2386 (Part III) - 1963** For determination of specific gravity and water absorption of aggregate. It is made of G.I. wire-mesh of approximate size 20 cm dia x 20 cm high. Complete with handle	**02**		
	5.5 Buoyancy Balance	Buoyancy balance is a multi-purpose type of unit with electronic balance for the determination of density of the sample, weight in water, volume of the sample, or for analysis of fresh concrete. The unit consists of a tubular frame, a carriage connected through chain to a ratchet. Balance is kept on the top of the table and has a hook for hanging the specimen. Powel and ratchet is provided to raise the plate form along with the plastic container filled with water. Balance has the capacity of 16kg.	**01**		
	5.6 Aggregate crushing value Apparatus (150 mm)	The apparatus for the standard test shall consist of the following : a) A 15-cm diameter open-ended steel cylinder, with plunger and base-plate, of the general form and dimensions shall be conforming **IS: 2386 (Part-IV)-1963.** The surfaces in contact with the aggregate shall be machined and case-hardened or otherwise treated so as to have a diamond (VH) pyramid hardness number of not less than 650 VH. b) For measuring the sample, cylindrical metal measure of sufficient rigidity to retain its form under rough usage and of the following internal dimensions: Diameter 11.5 cm Height 18.0 cm	**05**		
	5.7 Aggregate Crushing Value Apparatus (75 mm)	Aggregate Crushing Value Apparatus (75 mm) **IS: 9376-1979** Used for determining the Aggregate Crushing Value, The apparatus consists of a steel cylinder 75 mm dia, a plunger and a steel base plate. The surfaces coming into contact with the aggregate are case ardened.	**05**		
	5.8 Reaction Container	Reaction Container **IS:2386 (Part VII)** The reaction container is one of the important apparatus, required for determination of the Potential Alkali Reactivity of aggregates by chemical method when used in concrete having high alkali cement. It is made from stainless steel and fitted with air tight cover, held in position with special clamp.	**02**		
	5.9 Mechanical Sieve Shaker with IS: Sieves	It should be compact design and light weight and mounted on a bench top. This eliminates the use of concrete foundation. Noise has been reduced considerably in the new model. A digital timer adjustable from 0-99 minutes is	**01**		

		incorporated as an integral part of the equipment. The Sieve Shaker can carry upto 8 sieves of 20cm dia. It is driven by a ¼ HP geared motor. The Sieve Table is inclined from the vertical axis and the direction of inclination changes progressively in the clockwise direction. In addition to the gyratory motion of the table, there is a tapping motion as well. Should also supply Adapter for 30cm dia sieves Suitable for operation on 220 V, 50 Hz, Single Phase, AC supply IS 460-1962 are to used. The sieves for soil tests: 4.75 mm to 75 micron, Supplied complete with 7 set of sieves for course and fine aggregate Special notes: Manufacturer must have NABL accredited testing and calibration facility			
	5.10 Aggregate Impact Test Apparatus with counter	**IS: 9377-1979, IS:2386 (Part-IV)-1963** Aggregate Impact Test Apparatus with counter IS:9377-1979 The machine should be of sturdy construction consists of a base and support columns so as to form a rigid frame work around the quick release trigger mechanism to ensure an effective free fall of the hammer during the test. It should consist of the following: - i) A hammer of 13.75 kg mass which can be raised and allowed to fall freely through 380+ 5 mm with locking arrangement. A cylindrical cup, a metal measure and a tamping rod 10 mm dia x 230 mm long and automatic blow counter. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Centre in the State of Rajasthan.	**02**		
6.	**Test On Concrete**				
	6.1 Laboratory Concrete Mixer	Lab concrete mixer motorized 40 Ltrs capacity Concrete Mixer, Pan Type, Capacity 40L The Concrete Mixer has been designed for mixing small Quantities of concrete used in preparation of concrete cubes, for testing in laboratories. The purpose of the mixer is to smear mechanically the aggregate surface with cement paste uniformly & produce a mix of uniform consistency. This in turn gives consistent quality of cube specimens when casted in the moulds. The Concrete Mixer developed is transportable on wheels. The	**01**		

		design of mixing paddles ensures uniform &efficient mixing of cement & aggregate both in dry &wetconditions. This machine is suitable for aggregate sizeupto 20mm. The equipment can also be put to use for mixing of any other material in dry / wet conditions. The arrangement helps the operators to access the pan contents conveniently & emptying the mixture after completion of the operation. The drum is driven off the ribbed base. The lid with mixing paddles clears off the top of the drum to provide maximum access to the operator. Specifications : Mixing Capacity: 40 ltrs. Overall Dimension : 910mm x 875 mm x 1250mm Motor : 2 HP, 960 RPM Special Features : Portable & Compact. • Adjustable Blades. • Simple to clean & maintain. • Easy to operate. Suitable for operation on 440V, 50Hz, Three Phase, AC supply. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
	6.2 Slump Cone Apparatus	Slump Test Apparatus **IS : 7320-1974** (Reaffirmed 2013) Used for determination of slump of fresh concrete mix as a measure of its consistency where the nominal size of aggregate does not exceed 38 mm. It comprises the following :- A slump cone 100 mm dia at the top, 200 mm dia at the bottom, and 300 mm high with two cleats and lifting handles. A base plate with clamping arrangement for the slump cone and a swivel handle which also serves as the datum for measuring the slump. A tamping rod 1.6 cm dia and 60 cm long with one end rounded and graduated from 0 to 15 cm in 0.5 cm spacing to measure the slump.	**05**		
	6.3 Compacting Factor Test Apparatus	Compaction Factor Apparatus **IS : 5515-1983** Used for determination of compaction factor of fresh concrete with nominal maximum size of aggregate not exceeding 40 mm	**02**		

		as a measure of its workability. It is particularly suitable for mix of stiffer consistency. It comprises the following : (i) Two conical hoppers with trap doors. (ii) One cylindrical receiver 0.005 cu. m. volume. (iii) A welded steel stand for mounting the hoppers and the receiver co-axially at specified distances. (iv) Two trowels. (v)One hand scoop. Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
	6.4 Vee-Bee Consistometer Method	Vee-Bee Consistometer IS: 10510-1983 The apparatus should consist of the following :- i) A slump cone 100 mm inside dia at topo, 200 mm inside dia at base and 300 mm high ii) One container for the slump cone with two clamps and lifting handles iii) A vibrating table mounted on rubber shock absorbers and having a swivel arm atttached on one side. The swivel arm carries a funnel on one side and a graduated rod with Perspex disc on the other side. The rod should be graduated in centimetres to measure the slump and volume in the cylinder after vibration. Suitable for operation on 415V, 3 phase, 50Hz, AC Supply. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		

	6.5 Flow Table	Flow of Mortar and Hydraulic Cement : Ref. Standard IS:5512 (Hand operated) IS: 5512-1983 Used for making flow tests for consistency of mortars in tests of hydraulic cements and pozzolanic materials. It comprises the following: i) A machine table toop 250 mm dia of gun metal fitted with a vertical shaft. Total weight 4.00 ± 0.05 kg. ii)A cast iron frame with a machine base and a smooth vertic hole at the top for the table shaft. It has a horizontal shaft carryig a cam at one end and a hand wheel at the other. The cam allows 1 mm free drop of the table A conical mould 100 mm inside dia at bottom, 70 mm inside dia at topo and 50 mm high. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**02**		
	6.6 Vibrating Table	Vibrating Table IS: 2514-1963 The load carryig capacity of the table should be about 150 kg. The table should be supported on coiled springs and the ousing of the eccentric should be fitted below the table top. The table should be approx. 60 cm x 60 cm in size and has stops along all its sides to prevent the moulds from sliding away during vibration Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
	6.7 Mortar Penetrometer IS : 8142-1976	**IS : 8142-1976** The equipment should comprise of the following i) A barrel enclosing a calibrated spring and a pluger with a stem graduated frim 0-60 jgf in 1 kgf division. A handle should be fixed to the stem at the top ii) Two needle shanks marked at 1.25 cm intervals. iii) Six needle points with cross sectional areas 645, 323,	**02**		

		161, 65, 32 and 16 sq. mm. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
	6.8 100 kN Flexure Testing Machine Motorized	These machines are designed to conform to the essential requirements of **IS 9399-1979** or on request **IS 516**. 100 kN Flexure Testing Machine Motorized – Digital with In house NABL Calibration Certificate. Flexure testing machine capable of three-point loading and should consists of digital indicator with a pace rate indicator to indicate the pace rate on a bar graph. It should also display the load digitally. The least count should be 0.01KN and loading capacity of 100KN. Salient features of flexure testing machine: i) Light weight, rugged high strength frame ii) Double action hydraulic pump. iii) Self- aligning roller assembly. iv) Hydraulic jack provided with retraction spring. v) For testing beams of 100X100X500mm and 150X150X700mm. Suitable for operation on 220V, 50 Hz, Single Phase, AC supply. Supply complete with Beam Mould Ref : IS : 10086, EN 12390-1-2- Beam Mould, 100mm x 100mm x 500mm Beam Mould, 150mm x 150mm x 700mm Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.The OEM must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The OEM should have executed/ implemented such type of work/ supply order at any govt. institutions/ central and state universities/ IIT/ NIT/ PSU/ Research Organization. The OEM should have at least two orders minimum of Rs. 20 lakhs or a single order of Rs. 45 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
	6.9 Digital Rebound	Rebound hammer to find out the strength estimation of concrete	**01**		

	Hammer	The equipment should have following features: All data should be automatically recorded from the app to a web-based reporting tool. Manual data entry not necessarily required. Export reports in PDF or CSV. Hammer verification management tools help you keep your hammer calibrated. Impact results can be heard live in audio on Apple iOS devices via text-to-speech. Select units, form factor and correlation curves. Create your own custom curve as required by standards. Automatic data backup. TECHNICAL SPECIFICATION: Impact energy Type: N 2.207 Nm (1.63 ft lbf) Housing dimensions: 61 x 84 x 275 mm / 2.4 x 3.3 x 10.8 in Weight (N-hammer): 1090 g / 2.4 lb Hammer verification management tools help you keep your hammer calibrated. Memory: 2,000 measurement series Displays: Analog & backlit digital (100 x 100 pixels, graphic) Charger connection: Micro-USB Battery: Standard AAA, alkaline or rechargeable IP classification: IP54 The equipment must comply with following standard: USA: ASTM C805, ACI 228.1R Europe: EN12504-2, EN13791 China: JGJ-T23 Japan: JCSE-G504, JIS A1155 Russia: GOST 22690-2015 OEM/Dealer authorization should be compulsorily attached with the technical bid.			
	6.10 Ultrasonic Pulse Velocity Tester	UPV to assess the quality of concrete and its uniformity. Instrument should have following features: Compressive strength and SONREB in combination with Schmidt Hammer Determination of crack depth Modus of elasticity Scan Modes A-Scans Line Scans Area Scan E-Modulus Data Logging TECHNICAL SPECIFICATION: Range: 0.1 – 7930 µs Resolution: 0.1 µs (< 793 µs) Display: 7" colour touch display 800x480 pixels Pulse Voltage UPV: 100 – 450 Vpp Bandwidth: 20 – 500 kHz Receiver Gain: 1x – 10'000x (0 – 80dB) [11 steps] Memory: Internal 8 GB Flash memory Regional Settings: Metric and imperial units and multi-language supported Battery: Lithium Polymer, 3.6 V, 14.0 Ah Battery Lifetime: > 8h (in standard operating mode) Operating: 0°C – 30°C (Charging, running instrument) Temperature: 0°C – 40°C (Charging, instrument is off)-10°C – 50°C (Non-charging) Humidity: < 95 % RH, non condensing	**01**		

		IP Classification: IP54 The instrument should consists of: Touchscreen - 1 No. 2 Transducers 54 kHz - 1 No. 2 BNC cables 1.5 m - 1 No. Couplant - 1 No. Calibration rod - 1 No. BNC adapter cable - 1 No. Power supply - 1 No. USB cable - 1 No. DVD with software documentation - 1 No. Carrying strap and carrying case - 1 No. It should comply with following standards: EN12504-4 (Europe) ASTM C 597-02 (North America) BS 1881 Part 203 (UK) ISO1920-7:2004 (International) IS: 13311 (India) CECS21 (China) OEM/Dealer authorization should be compulsorily attached with the technical bid.			

2. Surveying & Advance Surveying Lab :

SR NO	ITEMS NAME	SPECIFICATION	QTY	UNIT	TOTAL

				PRICE	PRICE INCLUDIN GST
1.	**PLANE TABLE**	**Plane Table Complete Set(As per ISI Specifications) :** With Plane Table **Ist Quality** Board Size 750x600x**22mm**, with **Aluminium folding** tripod Stand and cantering table fixing with **Brass** plate having. Complete with following **All Brass Accessories:** Brass Alidade **(Heavy Pattern) 60cm**, **Brass** Spirit Level, **Brass** Magnetic (Trough) Compass, **Brass** Plumb bob with **Brass** Plumbing fork with canvas cover with handle for board. All accessories packed in Single wooden box.	**08**		
2.	**LEVELING STAFF**	**AluminumLevelingStaff : (Export-Quality),** Made of Aluminum body, Size 5 meter Telescopic type in **FIVE SECTIONS** accurately printed divisions numerical in RED and BLACK on WHITE ground graduations according to **IS: 1779-1961.** Providedwith **BACK SIDE MARKING IN CENTIMETRES** and push button automatic locking system, Supplied in waterproof Cover	**10**		
3.	**RANGING ROD**	**Ranging Rod:**Made of steel conduit pipe 25mm/1" dia. fitted with strong iron shoe, duly enamel painted Red & White each in 20cm. colour each. Size6 meter long in two fold, Packed in case	**40**		
4.	**SURVEYOR COMPASS**	**Surveyor Compass:** Size 100 mm dia., **Made of Brass Body,** fitted with graduated metal circle, packed in a PVC case with **Aluminum (Metallic)** Stand tripod stand having ball and socket head.	**5**		
5.	**ARROWS**	**Arrows:** As per Standard, actual size 40cm length, 50mm dia. above round circle, and lower 4mm dia.	**50**		
6.	**GLASS FIBRE TAPE**	**Glass Fibre Tape Freemans30 Meter IS STANDARD**	**5**		
7.	**OPTICAL SQUARE**	**OPTICAL SQUARE** Mirror Type , Circular , Made of Brass	**5**		
8.	**OFFSET ROD**	**OFFSET ROD 3** mt.	**5**		
9.	**PRISMATIC COMPASS**	**PRISMATIC COMPASS** 100mm dia. Made of Brass in PVC case With Aluminium Stand	**5**		
10.	**TILTING LEVEL**	**ISI ENGINEER'S TILTING LEVEL** 225 mm internal focusing , erect image , in fibre box with accessories & Aluminium Telescopic Tripod Stand	**02**		
11.	**DUMPY LEVEL**	**ISI DUMPY LEVEL** 300 mm internal focusing (Full Brass), erect image in wooden box with accessories & Aluminium telescopic Tripod Stand	**03**		
12.	**VERNIER TRANSIT THEODOLITE**	**ISI VERNIER TRANSIT THEODOLITE** (Watts pattern) Accuracy 10 sec. 175mm internal focussing in wooden box **.Erect Image. With Optical Plummet. With Aluminium Telescopic Tripod Stand in waterproof cover.**	**03**		
13.	**TACHOMETER**	**ISI Tachometer 10 second accuracy** ,measures angle both in horizontal as well as vertical direction , fitted with a magnetic compass in the centre to indicate the direction , complete with acc packed in a wooden box along with aluminum telescopic tripod stand	**05**		

14.	**BRUNTON COMPASS**	**BRUNTON COMPASS IMPORTED**	**2**		
15.	**TELESCOPIC ALIDADE**	**TELESCOPIC ALIDADE**	**2**		
16.	**ABNEY LEVEL**	**ABNEY LEVEL** 225 mm in carrying case	**3**		
17.	**TANGENT CLINOMETER**	**TANGENT CLINOMETER EXPORT QUALITY**	**2**		
18.	**OPTICAL SQUARE**	**OPTICAL SQUARE** Mirror Type , Circular , Made of Brass	**5**		
19.	**LINE RANGER**	**LINE RANGER**	**5**		
20.	**BOX SEXTANT**	**BOX SEXTANT with stand**	**5**		
21.	**PANTOGRAPH**	**PANTOGRAPH 60cm**	**5**		
22.	**CLINOMETERS COMPASS**	**Clinometers Compass 3" dia superior quality. Made of brass**	**2**		
23.	**DIGITAL PLANIMETER**	**Digital Planimeter**	**02**		
24.	**AUTOMATIC LEVEL**	**Automatic Level** Having 32x Magnification, Accuracy ±1mm Image Erect, Effective Objective Aperture 42mm, Min. Focus 0.4m, Field Of View 1 deg. 20 minute, Multiplication Constant 100, Additive Constant 0, Compensator Range ±15', Compensator Setting Accuracy ±0.6	**02**		
25.	**HAND HELD GPS**	**HAND HELD GPS** **GARMIN E TREX 10 HAND HELD GPS** Rugged Handheld GPS with Enhanced Capabilities ❖ Worldwide base map ❖ 2.2" monochrome display, easy to read in any light ❖ GPS and GLONASS satellites for faster positioning ❖ Paperless geo caching ❖ 25-hour battery life with 2 AA batteries	**02**		
26.	**Electronic Distance Measurement**	Electronic distance measurement (EDM) is a method of determining the length between two points using electromagnetic waves. Upto 100 m.	**01**		

3. **Fluid Mechanics & Hydraulic Engineering Lab :**

SR NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**To plot characteristics curve of Pelton Wheel.**	**Specifications:** • Sump Tank SS : 800mm x 550mm x 500mm • Head: 27 m Approx. • Discharge: Approx. 510 LPM approx. • Power Output : 1 Kw • Runner Diameter: 230 mm. • Number Of Buckets : 12 • Brake Drum Diameter: 200 mm. • Centrifugal Pump set suitable for supply of water of size coupled to 5 HP induction motor 3 phase 400 V. A. C. supply. • Flowing Measuring Unit: Pitot Tube with manometer • DOL Starter, piping, gate valve. • Spring Balance 5Kg- 1 No., 10Kg-1 No. **Range of Experiments:** To find out efficiency of a Pelton Turbine at various speeds. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should have to ISO/ CE certified Manufacturer who can ensure the manufacturing.	01		
2.	**Centrifugal Pump Test Rig.**	**Description:** The test rig consists of a single stage centrifugal pump set suitable for determining its characteristics such as the efficiency and input power at various head and discharge. An energy meter and stopwatch is provided to measure the input power to the pump set. A collecting tank is provided for measuring the actual flow rate. **Specifications:** • Capacity - 1HP, with DC motor variable speed type 4 Amp. • Sump tank - 600 x 400 x 350 mm height • Measuring tank - 250 x 400 x 450mm height • Energy meter • Pressure Gauge • Vacuum Gauge • On / Off Switch **Range of Experiments:** ❖ To find out efficiency of a Centrifugal pump Test Rig at various speeds. Measurement & Controls: Energy meter Pressure and vacuum gauges Stop watch Adequate pipes and control arrangement Equipment - with good quality paint structure. Range of Experiments: To find out efficiency of a Centrifugal pump Test Rig at various speeds. **Space Required:** Floor area-2m x 2m Supply-230v.15A, AC A technical manual accompanies with unit OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	01		
3.	**Francis Turbine Test Rig.**	**Francis Turbine Test Rig.** **Specifications:**	01		

		• Francis Turbine develop about 1kW output, made of Aluminium spiral casing, bearing housing and Guide vanes and runner. Transparent outlet with stainless steel draft tube. • Slotted dead weights for conducting experiments. Pressure gauge and a vacuum gauge for head measurement in meters. 200mm dia. cast iron water-cooled brake drum mounted on the main shaft for load test. The head of the turbine is 10 meters and discharge at about 1000 LPM • 5 HP supply pump set, suitable for supplying water to the above turbine and for operation on 400 Volts 3 phase 50 cycles AC mains. • DOL Starter suitable for the above Mono block pump set, mounted on a panel board. • Flow measuring unit, consisting of a pitot tube with manometer. • Piping system consisting of pipes, valves, fittings complete with suitable for the test rig. • S. S. Sump of size 800mm x 550mm x 550mm height to store sufficient water for independent circulation through the unit for **Experimentation and arranged within the floor space of the main unit.** • Rigid M. S. framework compactly fitted with all the above items as a self-sufficient package unit, suitable for operation without any foundation. Note: Space required 2m x 1m x 25m height **Range of Experiments:** • To find out efficiency of a Francis Turbine at various speeds. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
4.	**Reynolds Apparatus**	**Reynolds Apparatus** Acrylic Tube (Transparent) 25 mm OD of suitable length, Sump Tank of 500x400x350mm, supply tank of 300x300x550 mm Size. Die tank with die needle. Flow control valve, Measuring Flask & Stop Watch for flow measurement, Motor for recirculation Type Unit.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
5.	**Kaplan Turbine Test Rig.**	**Kaplan Turbine Test Rig.** **Specifications:** • A Pressure gauge and Vacuum Gauge for head measurement. Rope brake arrangement by two tubular balance methods. 200mm dia. cast iron water-cooled brake drum mounted on the main shaft for load test. The head of the turbine is 5 to 8 meters and discharge about 1500 LPM. • 7.5 HP pump set suitable for supplying water to the above turbine and for operation on 400 Volts 3 phase 50 cycles AC mains. • DOL, starter for the Pump set. • Flow measuring unit, consisting of pitot tube with manometer • Piping system consisting of pipes, valves, and fittings complete set suitable for the test rig. • SS. Sump of size 600mm x 1000mm x 500mm height to store sufficient water for independent circulation through the unit for experimentation and arranged within the floor space of the main unit. • Rigid M. S. framework compactly lilted with all the above items as a self-sufficient package unit suitable for operation without any foundation. **Range of Experiments:** • To find out efficiency of a Kaplan Turbine at various speeds OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer	**01**		

		should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
6.	**Pitot Tube Apparatus**	**Specification:** Pitot tube : Material Copper with Clear Acrylic (Compatible to 1. Dia. Pipe.) Water Circulation : FHP Pump, Kirloskar make. Flow Measurement : Using Measuring Tank with Piezometer Capacity 25 Liters. Sump Tank : Capacity 50 Liters. Stop Watch : Electronic. Control Panel : Standard make On/Off Switch, Mains Indicator, Etc. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
7.	**Reciprocating Pump**	**Specification:** Pump :Doubleacting,SingleCylinder,Capacity1H PSpeed250RPM Drive : ACMotorwithstep cone pulley arrangement for 3 Prefixed speeds. SupplyTankCapacity60Ltrs. MeasuringTank:Capacity40Ltrs. Controlpanel: withrequiredelectricalinstrumentation StopWatch : Electronic TankswillbemadeofStainlessSteel. Thewholeset-upiswelldesignedandarrangedinagoodqualitypaintedstructure.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
8.	**Losses in Pipe Fitting**	**To determine the minor losses.** **Losses in Pipe Fitting** **Specifications:** This is the basic module required by all the experimental setups. **Storage Tank** Sump Tank SS Size: 550mm x 400mm x 350 mm height. **Measuring Tank -** The collecting Tank is 250 mm x 400 mm x 400 mm height. Capacity approx. 40 liters, fitted with drain valve "1" size. piezometer tube with scale. **Mono block Pump :** Mono block, 1ph, ½ HP pump shall be provided with the set-up which shall be mounted on the base. Necessary piping with by-pass valve and suction piping are provided. The connection for the test equipment is made by flexible Hose pipe. • Differential manometer (with mercury). **Range of Experiments:** The apparatus is designed to demonstrate the loss of head due to the following fittings • Pipe Elbow • Sudden Contraction • Sudden Expansion • Pipe bends, OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the	**01**		

		State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
9.	**Friction factor**	**To determine the friction factor.** **Specifications:** • Three pipes: 15mm, 19 mm & 25mm I. D. nominal diameters approximately connected in a common manifold. • Pressure tapping at 1 m distance. • Supporting stand structure for the equipment. • Measuring tank with drain valve & piezometer tube. • Differential manometer.(with mercury) **Range of Experiments:** • To determine coefficient of friction for pipes. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
10.	**Hydraulic Tilting Flume**	**To determine Cd of Broad crested wier.** **Hydraulic Tilting Flume** The flume consists of a channel. At the inlet a flow steadying section is provided so that there will be fewer disturbances at the test section. The gates provided at the upstream and downstream of the test section help to regulate the depth of flow. Depth measurements can be achieved with the help of a hook or point gauge; mounted on a trolley which gives longitudinal and transverse movement. The slope of the bed can be adjusted to give positive or negative slopes.**Specifications:** • Size: Size - 0.25 m width. 0.30 m depth & 3 m test section length. • A pointer gauge mounted on a trolley. • Inlet pipe piece containing an orifice in it. • A differential manometer (without mercury) • A screw jack for adjusting slope. • A model of a Sharp crested Weir. • A model of a Broad crested weir. • A model of Venturi flume. • Sump Tank 1000mm x 600mm x 500 mm • 3 Phase 3 HP Centrifugal Pump **Range of Experiments:** • Study of open channel flow with slope. • **Study of hydraulic jump.** • **Study of Venturi flume.** • **Calibration of Sharp crested. Broad crested weir.** OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
11.	**Impact of Jet Apparatus**	**To verify the momentum equation.** Jet on vanes apparatus (impact of jet) **Impact of Jet Apparatus** **Specifications:** • 250 mm x 250 mm x 300 mm SS enclosure with opposite sides of glass mounted on a stand. • Arrangement to measure the force exerted. Sump Tank 550 x 400 x 350 mm. • Measuring tank - 250 mm x 400mm x 400 mm with drain valve. • Nozzle : Material Acrylic • Hemispherical vane • flat vane **Range of Experiments:** • To study the impact of jet on various types of vanes. OEM authorization should be compulsorily attached with the technical bid.	**01**		

		OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
12.	**Bernoulli's Theorem Apparatus**	**Specifications:** • **Inlet Tank : 250 mmx250 mmx450mm** Test Section : Clear Acrylic 370 mm long • Piezometer tubes equally spaced (9 nos.) • Measuring tank of size 250 mm x 400 mm x 400 mm. • Stop watch. Sump tank of size 700 mm x 400 mm x 350 mm. **Range of Experiments:** • Bernoulli's theorem for the flow of real liquid can be verified. • Hydraulic grade line & the total energy line along the flow section can be plotted & can be studied. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
13.	**Venturimeter&Orificemeter Apparatus**	**Specifications:** • Sump tank with flow - 550 mm x 400mm x 350 mm • Measuring tank SS- 250 mm x 400mm x 400 mm • Each line provided with flow control valve for setting of different flow rates. • Pressure tubes of different pipe lines are connected to common manometer. • Differential manometer (with mercury). **Range of Experiments:** • Calibration of Venturimeter • Calibration of Orifice meter OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
14.	**Metacentric Height of Ship Model**	**Specifications:** • S S. tank or size 600 mm x 400 mm x 400 mm with drain. • A hollow ship model with balancing weight. • A set of weights provided with the apparatus. • A graduated arc for measuring tilt angle. • Ship size 300 mm x 300mm x 300 mm height. Range of Experiments: • Determination of Met centric Height of a ship model OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
15.	**Orifice & Mouthpiece Apparatus**	**Specifications:** • Basic Set-up : This is the basic module required by all the experimental setups. • Storage Tank: 700 mm x 400mm x 350 mm. SS Made Measuring Tank 250mm x 400mm x 400mm. SS Made • Collecting Tank: Size of the collecting Tank is 300 mm x 300mm x 500 mm fitted with drain valve 1" size • piezometer Tube. With marking scale. • Monoblock Pump : Monoblock 1ph, ½ HP pump shall be provided with the setup which shall be mounted on the base. Necessary piping with by-pass valve and suction piping are provided. The connection for the test equipment is made by flexible Hose-pipe The Equipment: The present equipment is a set-up used to study the performance of Orifice meter & Mouth Piece.	**01**		

		Range of Experiments: The apparatus is designed to measure the co-efficient of discharge of orifice & mouthpiece. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
16.	**Notch Apparatus**	**Specifications:** • SS. storage tank (channel) of size 600 mm x 250 mm x 180 mm. Baffles for steadying water supply. Arrangement for fixing interchangeable Notches. Supporting stand for the equipment. • Measuring tank of 250 mm x 400 mm x 400 mm capacity with drain valve & piezometer tube. • Sump Tank size 550 mm x 400 mm X 350 mm. • Set of 2 Notches: 1) Rectangular Notch 2) 'V' Notch. **Range of Experiments:** • To determine Co-efficient of discharge (Cd) through a) Rectangular Notch b) V Notch OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
17.	**RED WOOD VISOMETER**	Capable for Direct readout of all measurement parameters Auto Range Facility in Time Function for measurement Facility in Sound alarm at under 20% Facility in Torque Linear calibration Wide range power supply:100V-240V Facility in Measuring Range(mPa.s) - 20 - 1,00,000 No. of Speed(RPM) - 6,12,30,60 Stepping Motor means Accurate, reliable operation Spindles - #1,#2,#3,#4 Capable for Direct Viscocity reading and Temperature Display Capable for All measurement parameters LCD Display with Backlight Auto Range Function OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
18.	**Forced Vortex Apparatus**	**Description:** It consists of a Transparent Cylindrical Vessel Which Can be rotated by a variable speed motor. In this vessel by using varies and a cylinder suitably, scientific free and forced vortices can be formed. An upper probe can be transverse horizontally and vertically across full diameter to the vessel, so that water surface profile can be measured in case of forced vortex both axes contains graduation so that exact position of the probe is known. The vessel will be mounted on suitable rotating platform with bottom drain arrangements for the vessel. This apparatus is used to visualize the free vortex. In this apparatus perplex pipe of dia 300mm is used. Four circumferential inlets have been placed along the circumference of the cylindrical near its bottom which helps in the formation of free vortex. A pointer gauge is used to measure the co-ordinates of vortex at various points. A centrifuge pump with 1/2 HP motor kirloskarMake . to make the supply from SS Sump tank, the tanks are well painted to prevent rust hence increases the life tank.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized	**01**		

		Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.			
19.	**Nozzle Meter Apparatus**	**Nozzle Meter Apparatus** Nozzlemeter : Material Clear Acrylic compatible to 1" Dia. Pipe. Water Circulation: FHP Pump, Kirloskar make. Flow Measurement : Using Measuring Tank with Piezometer, Capacity 25 Ltrs. Sump Tank : Capacity 50 Ltrs. Stop Watch : Electronic. Control Panel Comprises of: Standard make On/Off Switch, Mains Indicator, Etc. Tanks will be made of Stainless Steel. The Whole set-up is well designed and arrangement in good quality painted structure OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
20.	**Stroke's Law Apparatus for determining Viscosity**	**Stroke's Law Apparatus for determining Viscosity** Tubes (1 No.): Material Borosilicate Glass tube. Gate Valves: 1 Nos. Stop Watch: Electronic. Steel balls of different sizes will be provided. The whole set-up is well designed and arranged in a good quality painted structure.	**01**		
21.	**Hydraulic Test Bench With Accessories**	**Description:** This is a water re-circulation system consisting of a water sump tank, mono block pump, top tray with drain, discharge measurement tank, and a bye-pass arrangement for the mono block pump. Hydraulic Test Bench with necessary accessories forms a needful laboratory facility which enables to perform various Fluid Mechanics experiments. Standard Features: Bye-pass line is also used to regulate the discharge Following apparatus are provided with this bench as per requirements. Impact of Jet Apparatus, Bernoullis Theorem Apparatus. Flow Measurement by Venturimeter. Flow measurement by orificemeter. Pitot Tube Apparatus. Orifice and Mouthpieces Apparatus. Notch Apparatus. Losses in Pipe Fitting Apparatus. Pipe Friction Apparatus. Reynolds Apparatus. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		
22.	**Series & Parallel Pump Test Rig**	**Series & Parallel Pump Test Rig**	**01**		

		Pump : 0.5 HP, 2 Nos kirloskar Make Supply Tank : Capacity 150 Ltrs .SS make Measuring Tank : Capacity 40 Ltrs.SS make Electrical input : Through Energy meter Pressure measurement : 2 Nos(0-4 kg/cm^2) Suction Measurement : 2 Nos(0-760 mmHg) Necessary piping & valves for series & parallel operation of the pumps Control panel instrumentation : with required electrical Stop Watch : Electronic			
23.	**Gear Pump Test Rig. / Oil Pump Test Rig. (A.C Motor)**	Following Characteristics can be studied at different speeds, which can be adjusted by using stepped pulley: **1)** Discharge v/s Head **2)** Discharge v/s Input to pump **3)** Discharge v/s Pump Efficiency	**01**		
24.	**Darcys Law Apparatus**	**Specification:** The set up should consist of cylindrical test section filled with porous medium. Pressure tapping provided in the test section to measure the pressure drop with help of differential manometer control valves are fitted in the water line to regulate flow of water in the section. It should be self-contained water re-circulating unit provided with a sump tank and a centrifugal pump etc. Flow control valve and by pass valve are fitted in water line to conduct the experiment different flow rates. Flow rate of water is measured with the help of measuring tank and stop watch. Technical Details: Cylinder material SS, Dia. 200 mm (Approx) Height : 500 mm approx Water Circulation: FHP Pump. Measuring tank with piezometer tube. Sump Tank : Made of Stainless Steel, Compatible Capacity Stop Watch: Electronic control Panel comprise of Standard make On/Off switch, Mains Indicator, Fuse etc. Tank Will be made Up of SS. The Whole Set- Up is well Design and Arranged in Good Quality Painted Structure. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Supplier or Manufacturer should haveto ISO/ CE certified Manufacturer who can ensure the manufacturing.	**01**		

4. Environmental Engineering Lab :

SR NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTA PRIC INCLUI G GS
1.	PH METER	pH Range -2.000 to 16.000 pH (Standard Mode), -2.00 to 16.00 pH (Basic Mode) pH Resolution 0.001 pH, 0.01 pH pH Accuracy ±0.01 pH, ±0.002 pH pH Calibration 5 points (standard mode): 1.68, 4.01 (3.00†), 6.86, 7.01, 9.18, 10.01, 12.45, and two custom buffers; 3 points (basic mode) 4.01; 6.86; 7.01; 9.18; 10.01 pH Temperature Compensation ATC: -5.0 to 100.0°C; 23.0 to 212.0°F* pH CAL Check (electrode diagnostics) Yes pH Input impedence digital pH electrode input ORP Range ±2000.0 mV ORP Resolution 0.1 mV ORP Accuracy ±0.2 mV (±999.9 mV); ±1 mV (±2000 mV) mV Range ±1000.0 pH in mV mV Resolution 0.1 mV mV Accuracy ±0.2 mV Temperature Range -20.0 to 120.0 °C, -4.0 to 248.0 °F Temperature Resolution 0.1 °C, 0.1 °F Temperature Accuracy ±0.5 °C, ±0.9 °F pH Electrode HI11310 pH electrode (included) Temperature Probe integrated into pH electrode Logging Type log-on-demand; log-on-stability, interval logging Logging Memory up to 1000 records; log-on-demand (max. 200 logs); manual log-on-stability (max. 200 logs); interval logging (max. 600 samples; 100 lots) Connectivity 1 micro USB port for charging and PC connectivity, 1 USB port for flash storage GLP Yes Calibration Timeout Reminder Yes Autoend Yes Display segmented LCD Battery Type/Lifebuilt-in rechargeable battery with up to 8 hours of continuous use Power Supply 5 VDC adapter (included) Environment 0 to 50°C (32 to 122°F), RH max 95% non-condensing Dimensions 202 x 140 x 12.7mm (8" x 5.5" x 0.5") Weight 250 g (8.82 oz) OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. Who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	01		
2.	TURBIDITY METER	The meter is supplied complete with AMCO-AEPA-1 primary turbidity standards used for calibration and performance verification. The meets and exceeds the requirements of EPA Method 180.1 and Standard Methods for the Examination of Water and Wastewater 2130 B for turbidity measurements. Fast Tracker™ - Tag Identification System (T.I.S) USB for data transfer Operates on batteries or line voltage Turbidity Range 0.00 to 9.99; 10.0 to 99.9; 100 to 1000 NTU Turbidity Resolution 0.01; 0.1; 1 NTU	01		

		Turbidity Accuracy ±2% of reading plus 0.02 NTU Turbidity Repeatability ±1% of reading or 0.02 NTU, whichever is greater Turbidity Stray Light < 0.02 NTU Turbidity Calibration two, three, or four-point calibration Turbidity Measuring Method ratio nephelometric method (90° & 180°). Adaptation of the USEPA Method 180.1 and Standard Method 2130 B Turbidity Measuring Modes normal, average, continuous Turbidity Light Source tungsten filament lamp Turbidity Light Detector silicon photocell Logging Memory 200 records Connectivity USB or RS232 Automatic Shut-Off auto-off after 15 minutes of non-use Display 60 x 90 mm backlit LCD Battery Type/Life4 (1.5V) AA alkaline batteries Power Supply 4 (1.5V) AA alkaline batteries or AC adapter Environment 0 to 50°C (32 to 122°F), RH max 95% non-condensing Dimensions 224 x 87 x 77 mm (8.8 x 3.4 x 3.0") OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
3.	**dissolved oxygen (DO) meter**	Dissolved Oxygen Measurement Type polarographic Dissolved Oxygen Range 0.00 to 50.00 ppm (mg/L); 0.0 to 600.0% saturation Dissolved Oxygen Resolution 0.01 ppm (mg/L); 0.1% saturation Dissolved Oxygen Accuracy ±1.5% of reading ±1 digit Dissolved Oxygen Calibration automatic one or two point at 100% saturation (8.26 mg/L) and 0% saturation (0 mg/L) Dissolved Oxygen Temperature Compensation automatic from 0.0 to 50.0 °C (32.0 to 122.0 °F) Barometric Pressure Compensation automatic from 450 to 850 mmHg Salinity Compensation automatic from 0 to 70 g/L Atmospheric Pressure Range 450 to 850 mm Hg; 17.72 to 33.46 in Hg; 600.0 to 1133.2 mbar; 8.702 to 16.436 psi; 0.5921 to 1.1184 atm; 60.00 to 113.32 kPa Atmospheric Pressure Resolution 0.1 mm Hg; 0.01 in Hg; 0.1 mbar; 0.001 psi; 0.0001 atm; 0.01 kPa Atmospheric Pressure Accuracy ±3 mm Hg within ±15% from	**01**		

		calibration point Atmospheric Pressure Calibration automatic at one custom point Temperature Range -20.0 to 120.0°C (-4.0 to 248.0°F) Temperature Resolution 0.1°C (0.1°F) Temperature Accuracy ±0.2°C; ±0.4°F (excluding probe error) DO Probe polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4m (13') cable (included) Logging Type Log-on-demand Logging Memory up to 400 samples Connectivity opto-isolated USB with optional HI 92000 software and micro USB cable Automatic Shut-Off user selectable: 5, 10, 30, 60 minutes or disabled BOD/OUR/SOUR direct DO; BOD (biochemical oxygen demand); OUR (oxygen uptake rate); SOUR (specific oxygen uptake rate) Battery Type/Life1.5V AA batteries (4) / approximately 200 hours of continuous use without backlight (50 hours with backlight) Environment 0 to 50°C (32 to 122°F); RH 100% (IP67) Dimensions 185 x 93 x 35.2 mm (7.3 x 3.6 x 1.4") Weight 400 g (14.2 oz.), Complete with Zero Oxygen Solution, 500ml Bottle OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
4.	**COD Meter with Multiparameter Test**	Facility to measure measures 40 different key water and wastewater quality parameters using 73 different methods that allow for multiple ranges and variations in chemistry for specific applications. supplied should be COD test tube heater with 25 vial capacity; Temperature of Reaction 105°C or 150°C (221°F or 302°F) 230V, COD, LR EPA*, dichromate method, Reagent kit for 25 test vials (O2, COD, MR EPA*, dichromate method, Reagent kit for 25 test vials (O2), COD, HR, dichromate method, Reagent kit for 25 test vials (O2), The Chemical Oxygen Demand (COD) parameter is included for industrial and municipal wastewater treatment. The Phosphorous and Nitrogen parameters included are beneficial to municipal wastewater treatment customers that need to monitor their biological and chemical nutrient removal process. This photometer features an innovative optical system that uses LEDS, narrow band interference filters, focusing lens and both a silicon photodetector for absorbance measurement and a reference detector to maintain a consistent light source ensures accurate and repeatable photometric readings every time. A digital pH electrode input is provided allowing the user to measure pH by a traditional glass electrode. The digital pH electrode has a built in microchip within the probe that stores all of the calibration information. Having the calibration information stored in the probe allows for hot swapping of pH electrodes without having to recalibrate. All pH measurements are automatically compensated for temperature variations with a built in thermistor located in the tip of the sensing bulb for fast and	**01**		

accurate temperature measurement.
Two USB ports are provided for transferring data to a flash drive or computer and to use as a power source for the meter. For added convenience and portability the meter can also operate on an internal 3.7 VDC Lithium-polymer rechargeable battery.
The offers an absorbance measuring mode that allows for CAL Check standards to be used to validate the performance of the system. The absorbance mode allows the user to select one of the 5 wavelengths of light (420 nm, 466 nm, 525 nm, 575 nm, and 610 nm) to measure and plot their own concentration versus absorbance mode. This is useful for users with their own chemical method and for education to teach the concept of absorbance by using the Beer-Lambert Law.
Backlit 128 x 64 Pixel Graphic LCD Display
Backlit graphic display allows for easy viewing in low light conditions
The 128 x 64 Pixel LCD allows for a simplified user interface with virtual keys and on-screen help to guide the user through use of the meter
Built-in Reaction Timer for Photometric Measurements
The measurement is taken after the countdown timer expires.
Countdown timer ensures that all readings are taken at the appropriate reaction intervals regardless of user for better consistency in measurements
Absorbance mode
exclusive CAL Check cuvettes for validation of light source and detector
Allows for the user to plot concentration versus absorbance for a specific wavelength for use with user supplied chemistry or for teaching principles of photometry
Units of Measure
Appropriate unit of measure along with chemical form is displayed along with reading
Result Conversion
Automatically convert readings to other chemical forms with the touch of a button
Cuvette Cover
Aids in preventing stray light from affecting measurements
Digital pH Electrode Input
Measure pH and temperature with a single probe
Good Laboratory Practice (GLP) to track calibration information including date, time, buffers used, offset and slope for traceability
pH CAL Check alerts user to potential problems during the calibration process
Space saving having a pH meter and photometer built into one meter
Data Logging
Up to 1000 photometric and pH readings can be stored by simply pressing the dedicated LOG button. Logged readings are just as easily recalled by pressing the RCL button
Sample ID and User ID information can be added to a logged reading using alphanumeric keypadConnectivityLogged readings can be quickly and easily transferred to a flash drive using the USB-A host port or to a computer using the micro USB-B portData is exported as a .CSV file for use with common spreadsheet programsBattery Status IndicatorIndicates the amount of battery life leftErrorMessagesPhotometric error messages include no cap, high zero, and standard too lowpH calibration messages include clean electrode, check buffer and check probe
Capable for other water testing parameter also..
pH Range Photometer: 6.5 to 8.5 pH

pH electrode: -2.00 to 16.00 pH

pH Resolution Photometer: 0.1 pH

pH electrode: 0.01 pH

pH Accuracy Photometer: ±0.1 pH

pH electrode: ±0.01 pH

pH Calibration Automatic one or two point calibration with one set of

		standard buffers available (4.01, 6.86, 7.01, 9.18, 10.01) pH Temperature Compensation Automatic (-5.0 to 100.0 oC; 23.0 to 212.0 oF); limits reduced based on the pH electrode used pH CAL Check (electrode diagnostics) clean electrode and check buffer/check probe displayed during calibration pH Method Photometer: phenol red pH-mV Range ±1000 mV pH-mV Resolution 0.1 mV pH-mV Accuracy±0.2 mV Dissolved Oxygen Range 0.0 to 10.0 mg/L (as O2) Dissolved Oxygen Resolution 0.1 mg/L Dissolved Oxygen Accuracy ±0.4 mg/L ±3% of reading Dissolved Oxygen Measurement Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Azide modified Winkler method Absorbance Range 0.000 to 4.000 Abs Absorbance Resolution 0.001 Abs Absorbance Accuracy +/-0.003Abs @ 1.000 Abs Alkalinity Range Freshwater: 0 to 500 mg/L (as CaCO3) Seawater: 0 to 300 mg/L (as CaCO3) Alkalinity Resolution 1 mg/L Alkalinity Accuracy ±5 mg/L ±5% of reading Alkalinity Method Colorimetric method Aluminum Range0.00 to 1.00 mg/L (as Al3+) Aluminum Resolution 0.01 mg/L Aluminum Accuracy ±0.04 mg/L ±4% of reading Aluminum Method Adaptation of the aluminon method Photometer/Colorimeter Light Detector silicon photodetector Bandpass Filter Bandwidth 8 nm Bandpass Filter Wavelength Accuracy ±1 nm Cuvette Type round, 24.6 mm Number of Methods 128 max. GLP calibration data for connected pH electrode Display 128 x 64 pixel LCD with backlight Logging Type log on demand with user name and sample ID optional input Logging Memory 1000 readings Connectivity USB-A host for flash drive; micro-USB-B for power and computer connectivity Power Supply 5 VDC USB 2.0 power adapter with USB-A to micro-			

		USB-B cable (included) Battery Type/Life3.7 VDC Li-polymer rechargeable battery / >500 photometric measurements or 50 hours of continuous pH measurement Environment 0 to 50.0 oC (32 to 122.0 oF); 0 to 95% RH, non-condensing Weight 1.0 kg (2.2 lbs.) OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
5.	**Conductivity/TDS/Salinity meter**	EC Range 0.00 to 29.99 µS/cm, 30.0 to 299.9 µS/cm, 300 to 2999 µS/cm, 3.00 to 29.99 mS/cm, 30.0 to 200.0 mS/cm, up to 500.0 mS/cm (absolute EC)** EC Resolution 0.01 µS/cm, 0.1 µS/cm, 1 µS/cm, 0.01 mS/cm, 0.1 mS/cm EC Accuracy ±1% of reading (±0.05 µS/cm or 1 digit, whichever is greater) EC Calibration 1 point offset calibration (0.00 µS/cm in air), 1 point slope calibration in EC standard 84 µS/cm, 1413 µS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm and 111.8 mS/cm TDS Range 0.00 to 14.99 ppm (mg/L), 15.0 to 149.9 ppm (mg/L), 150 to 1499 ppm (mg/L), 1.50 to 14.99 g/L, 15.0 to 100.0 g/L, up to 400.0 g/L (absolute TDS)** TDS Resolution 0.01 ppm, 0.1 ppm, 1 ppm, 0.01 g/L, 0.1 g/L TDS Accuracy ±1% of reading (±0.03 ppm or 1 digit, whichever is greater) TDS Calibration through EC calibration EC/TDS Temperature Compensation Automatic -5 to 100° C (23 to 212° F); NoTC - none absolute conductivity. Temperature Correction Coefficient0.00 to 6.00% / °C (for EC and TDS only). Default value is 1.90% / °C EC to TDS Conversion Factor 0.40 to 0.80 (default value is 0.50) Salinity (% NaCl) Range 0.0 to 400.0% NaCl Salinity (% NaCl) Resolution 0.1% NaCl Salinity (% NaCl) Accuracy ±1% of reading Salinity (% NaCl) Calibration Single point with HI 7037L Standard Salinity (PSU) Range 2.00 to 42.00 PSU Salinity (PSU) Resolution 0.01 PSU Salinity (PSU) Accuracy ±1% of reading Salinity Range 0.0 to 80.0 g/L* Salinity Resolution (ppt) 0.01 g/L Salinity Accuracy (ppt) ±1% of reading	01		

		Temperature Range -20.0 to 120.0 °C ; -4.0 to 248.0 °F** Temperature Resolution 0.1 °C; 0.1 °F Temperature Accuracy ±0.5 °C; ±0.9 °F EC/TDS Probe HI763100 EC/temperature probe Logging Type Manual Log on Demand (Max. 200 logs); Manual Log on Stability (Max. 200 logs); Interval Logging 100 lots, Max. 600 logs/lot Logging Memory Up to 1000 records Connectivity 1 micro USB port for charging and PC connectivity, 1 USB port for storage GLP yes Battery Type/LifeBuilt-in rechargeable battery with up to 8 hours of continuous use Power Supply 5 VDC adapter (included) Environment 0 to 50°C (32 to 122°F), RH max 95% non-condensing Dimensions 202 x 140 x 12.7mm (8" x 5.5" x 0.5") Weight 250 g (8.82 oz) OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
6.	**SPECTROPHOTOMETER**	Features precise wavelength selection between 340 nm to 900 nm for complete method compliance and accuracy that is necessary in industries like professional laboratories, water treatment facilities, wineries, and more. Results are consistent and accurate regardless of throughput with the high quality and uniquely designed optics system. pH Range 6.5 to 8.5 pH pH Resolution 0.1 pH pH Accuracy ±0.1 pH pH Method Adaptation of the Phenol Red method Dissolved Oxygen Range 0.0 to 10.0 mg/L (as O2) Dissolved Oxygen Resolution 0.1 mg/L Dissolved Oxygen Accuracy ±0.4 mg/L ±3% of reading Dissolved Oxygen Measurement Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Azide modified Winkler method Absorbance Range 0.000 to 3.000 Abs Absorbance Resolution 0.001 Abs Absorbance Accuracy 5 mAbs at 0.000-0.500 Abs 1% at 0.500-3.000 Abs Alkalinity Range 0 to 500 mg/L (as CaCO3)	**01**		

		Alkalinity Resolution 1 mg/L Alkalinity Accuracy ±5 mg/L ±5% of reading Alkalinity Method Colorimetric Method Seawater Alkalinity Range 0 to 300 mg/L (as CaCO3) Seawater Alkalinity Resolution 1 mg/L Seawater Alkalinity Accuracy ±5 mg/L ±5% of reading Seawater Alkalinity Method Colorimetric Method Aluminum Range 0.00 to 1.00 mg/L (as Al3+) Aluminum Resolution 0.01 mg/L Aluminum Accuracy ±0.04 mg/L ±4% of reading Aluminum Method Adaptation of the aluminon method. Ammonia Range Low Range:0.00 to 3.00 mg/L (as NH3 -N) Medium Range: 0.00 to10.00 mg/L (as NH3 -N) High Range: 0.0 to 100.0 mg/L (as NH3 -N) Ammonia Resolution Low and Medium Range: 0.01 mg/L High Range: 0.1 mg/L Ammonia Accuracy Low Range: ±0.04 mg/L ±4% of reading Medium Range: ±0.05 mg/L ±5% of reading High range: ±0.5 mg/L ±5% of reading Ammonia Method Adaptation of the ASTM Manual of Water and Environmental Technology, D1426 Nessler method. Anionic Surfactants Range 0.00 to 3.50 mg/L (as SDBS) Anionic Surfactants Resolution 0.01 mg/L Anionic Surfactants Accuracy ±0.04 mg/L ±3% of reading Anionic Surfactants Method Adaptation of the USEPA method 425.1 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 5540C, Anionic Surfactants as MBAS Bromine Range 0.00 to 8.00 mg/L (as Br2) Bromine Resolution 0.01 mg/L Bromine Accuracy ±0.08 mg/L ±3% of reading Bromine Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method Calcium Range 0 to 400 mg/L (as Ca2+) Calcium Resolution 1 mg/L Calcium Accuracy ±10 mg/L ±5% of reading Calcium Method Adaptation of the Oxalate method Carbon Dioxide Range 0.00 to 2.00 mg/L (as ClO2) Carbon Dioxide Resolution 0.01 mg/L Carbon Dioxide Accuracy ±0.10 mg/L ±5% of reading		

		Carbon Dioxide Method Adaptation of the Chlorophenol Red method Chemical Oxygen Demand Range Low Range: 0 to 150 mg/L (as O2) Medium Range: 0 to 1500 mg/L (as O2) High Range: 0 to 15000 mg/L (as O2) Chemical Oxygen Demand Resolution 1 mg/L Chemical Oxygen Demand Accuracy Low Range: ±5 mg/L or ±4% of reading Medium Range: ±15 mg/L or ±4% of reading High Range: ±150 mg/L or ±2% of reading Chemical Oxygen Demand Method Adaptation of the USEPA 410.4 Chloride Range 0.0 to 20.0 mg/L (as Cl) Chloride Resolution 0.1 mg/L Chloride Accuracy ±0.5 mg/L ±6% of reading Chloride Method Adaptation of the mercury(II) thiocyanate method Chlorine Dioxide Range 0.00 to 2.00 mg/L (as ClO2) Chlorine Dioxide Resolution 0.01 mg/L Chlorine Dioxide Accuracy ±0.10 mg/L ±5% of reading Chlorine Dioxide Method Adaptation of the Chlorophenol Red method Free Chlorine Range Ultra Low Range : 0.000 to 0.500 mg/L (as Cl2) Low Range : 0.00 to 5.00 mg/L (as Cl2) High Range : 0.00 to 10.00 mg/L (as Cl2) Free Chlorine Resolution Ultra Low Range : 0.001 mg/ Low Range : 0.01 mg/L High Range : 0.01 mg/L Free Chlorine Accuracy Ultra Low Range : ±0.020 mg/L ±3% of reading Low Range : ±0.03 mg/L ±3% of reading High Range : ±0.03 mg/L ±3% of reading Total Chlorine Range Ultra Low Range : 0.000 to 0.500 mg/L (as Cl2) Low Range : 0.00 to 5.00 mg/L (as Cl2) High Range : 0.00 to 10.00 mg/L (as Cl2) Ultra HighRange : 0 to 500 mg/L (as Cl2) Total Chlorine Resolution Ultra Low Range : 0.001 mg/L Low Range : 0.01 mg/L High Range : 0.01 mg/L Ultra HighRange : 1 mg/L Total Chlorine Accuracy Ultra Low Range : ±0.020 mg/L ±3% of reading Low Range : ±0.03 mg/L ±3% of reading High Range : ±0.03 mg/L ±3% of reading			

Ultra HighRange : ±3 mg/L ±3% of reading

Chromium, Hexavalent Range Low Range : 0 to 300 µg/L (as Cr(VI))

High Range : 0 to 1000 µg/L (as Cr(VI))

Chromium, Hexavalent Resolution Low Range : 1 µg/L

High Range : 1 µg/L

Chromium, Hexavalent Accuracy Low Range : ±10 µg/L ±4% of reading

High Range : ±5 µg/L ±4% of reading at 25 °C

Chromium, Hexavalent Method Adaptation of the ASTM Manual of Water and Environmental Technology, D1687, Diphenylcarbohydrazide method

Color, Water Range 0 to 500 PCU (Platinum Cobalt Units)

Color, Water Resolution 1 PCU

Color, Water Accuracy ±10 PCU ±5% of reading

Color, Water Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Colorimetric Platinum Cobalt method

Color, Maple Syrup Range 0.00 to 100.00 %T

Color, Maple Syrup Resolution 0.01 %T

Color, Maple Syrup Accuracy ±3% of reading

Color, Maple Syrup Method Direct measure

Copper Range Low Range : 0.000 to 1.500 mg/L (as Cu)

High Range : 0.00 to 5.00 mg/L (as Cu)

Copper Resolution Low Range :0.001 mg/L

High Range : 0.01 mg/L

Copper Accuracy Low Range : ±0.010 mg/L ±5% of reading

High Range : ±0.02 mg/L ±4% of reading

Copper Method Adaptation of the EPA method

Cyanide Range 0.000 to 0.200 mg/L (as CN-)

Cyanide Resolution 0.001 mg/L

Cyanide Accuracy ±0.005 mg/L ±3% of reading

Cyanide Method Pyridine-Pyrazalone

Cyanuric Acid Range 0 to 100 mg/L (as CYA)

Cyanuric Acid Resolution 1 mg/L

Cyanuric Acid Accuracy ±1 mg/L ±15% of reading

Cyanuric Acid Method Adaptation of the turbidimetric method

Fluoride Range Low Range : 0.00 to 2.00 mg/L (as F)

High Range : 0.0 to 20.0 mg/L (as F)

Fluoride Resolution Low Range : 0.01 mg/L

High Range : 0.1 mg/L

		Fluoride Accuracy Low Range : ±0.03 mg/L ±3% of reading High Range : ±0.5 mg/L ±3% of reading Fluoride Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, SPADNS method Hardness, Total Range Low Range : 0 to 250 mg/L (as CaCO3) Medium Range : 200 to 500 mg/L (as CaCO3) High Range : 400 to 750 mg/L (as CaCO3) Hardness, Total Resolution 1 mg/L Hardness, Total Accuracy Low Range : ±5 mg/L ±4% of reading Medium Range : ±7 mg/L ±3% of reading High Range : ±10 mg/L ±2% of reading Hardness, Total Method Adaptation of the EPA recommended method 130.1 Hardness, Calcium Range 0.00 to 2.70 mg/L (as CaCO3) Hardness, Calcium Resolution 0.01 mg/L Hardness, Calcium Accuracy ±0.11 mg/L ±5% of reading Hardness, Calcium Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Calmagite method Hardness, Magnesium Range 0.00 to 2.00 mg/L (CaCO3) Hardness, Magnesium Resolution 0.01 mg/L Hardness, Magnesium Accuracy ±0.11 mg/L ±5% of reading Hardness, Magnesium Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, EDTA Colorimetric method Hydrazine Range 0 to 400 µg/L (as N2H4) Hydrazine Resolution 1 µg/L Hydrazine Accuracy ±4% of full scale reading Hydrazine Method Adaptation of the ASTM Manual of Water and Environmental Technology, method D1385, p-Dimethylaminobenzaldehyde method Iodine Range 0.0 to 12.5 mg/L (as I2) Iodine Resolution 0.1 mg/L Iodine Accuracy ±0.1 mg/L ±5% of reading Iodine Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method Iron Range Low Range : 0.000 to 1.600 mg/L (as Fe) High Range : 0.00 to 5.00 mg/L (as Fe) Iron Resolution Low Range : 0.001 mg/L High Range : 0.01 mg/L Iron Accuracy Low Range : ±0.010 mg/L ±8% of reading High Range : ±0.04 mg/L ±2% of reading			

		Iron Method Low Range : Adaptation of the TPTZ Method High Range : Adaptation of the EPA Phenanthroline method 315B, for natural and treated waters Magnesium Range 0 to 150 mg/L (as Mg2+) Magnesium Resolution 1 mg/L Magnesium Accuracy ±5 mg/L ±3% of reading Magnesium Method Adaptation of the Calmagite method Manganese Range Low Range : 0 to 300 µg/L (as Mn) High Range : 0.0 to 20.0 mg/L (as Mn) Manganese Resolution Low Range : 1 µg/L High Range : 0.1 mg/L Manganese Accuracy Low Range : ±10 µg/L ±3% of reading High Range : ±0.2 mg/L ±3% of reading Manganese Method Low Range : Adaptation of the PAN Method High Range : Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Periodate method Molybdenum Range 0.0 to 40.0 mg/L (as Mo6+) Molybdenum Resolution 0.1 mg/L Molybdenum Accuracy ±0.3 mg/L ±5% of reading Molybdenum Method Adaptation of the mercaptoacetic acid method Nickel Range Low Range : 0.000 to 1.000 mg/L (as Ni) High Range : 0.00 to 7.00 g/L (as Ni) Nickel ResolutionLow Range : 0.001 mg/L High Range : 0.01 g/L Nickel Accuracy Low Range : ±0.010 mg/L ±7% of reading High Range : ±0.07g/L ±4% of reading Nickel Method Low Range : Adaptation of the PAN method High Range : Adaptation of the photometric method Nitrate Range 0.0 to 30.0 mg/L (as NO3 - N) ChromotropicAcid : 0.0 to 30.0 mg/L (as N03--N) Nitrate Resolution 0.1 mg/L Nitrate Accuracy ±0.5 mg/L ±10% of reading ChromotropicAcid : ±1.0 mg/L or ±3% of reading Nitrate Method Adaptation of the cadmium reduction method ChromotropicAcid :Chromotropic acid method Nitrite Range Marine Ultra Low Range : 0 to 200 µg/L (as N02 -N) Low Range : 0 to 600 µg/L (as NO2 -N) High Range : 0 to 150 mg/L (as NO2-)			

		Nitrite Resolution Marine Ultra Low Range : 1 µg/L Low Range : 1 µg/L High Range : 1 mg/L Nitrite Accuracy Marine Ultra Low Range : ±10 µg/L ±4% of reading Low Range : ±20 µg/L ±4% of reading High Range : ±4 mg/L ±4% of reading Nitrite Method Marine Ultra Low Range : Adaptation of the EPA Diazotization method 354.1 Low Range : Adaptation of the EPA Diazotization method 354.1 High Range : Adaptation of the Ferrous Sulfate method Nitrogen, Total Range Low Range : 0.0 to 25.0 mg/L (as N) High Range : 10 to 150 mg/L (as N) Nitrogen, Total Resolution Low Range : 0.1 mg/L High Range : 1 mg/L Nitrogen, Total Accuracy Low Range : ±1.0 mg/L or ±5% of reading High Range : ±3 mg/L or ±4% of reading Nitrogen, Total Method Chromotropic acid method Oxygen, Scavenger Range Carbohydrazide : 0.00 to 1.50 mg/L (as Carbohydrazide) Diethylhydroxylamine)(DEHA) : 0 to 1000 µg/L (as DEHA) Hydroquinone : 0.00 to 2.50 mg/L (as Hydroquinone) Iso-ascorbic Acid :0.00 to 4.50 mg/L (as Iso-ascorbic acid) Oxygen, Scavenger Resolution Carbohydrazide : 0.01 mg/L Diethylhydroxylamine)(DEHA) : 1 µg/L Hydroquinone : 0.01 mg/L Iso-ascorbic Acid : 0.01 mg/L Oxygen, Scavenger Accuracy Carbohydrazide : ±0.02 mg/L ±3% of reading Diethylhydroxylamine)(DEHA) : ±5 µg/L ±5% of reading Hydroquinone : ±0.04 mg/L ±3% of reading Iso-ascorbic Acid : ±0.03 mg/L ±3 % of reading Oxygen, Scavenger Method Adaptation of the iron reduction method Ozone Range 0.00 to 2.00 mg/L (as O3) Ozone Resolution 0.01 mg/L Ozone Accuracy ±0.02 mg/L ±3% of reading Ozone Method Colorimetric DPD Method Phosphate Range Low Range : 0.00 to 2.50 mg/L (as PO4 3-) High Range : 0.0 to 30.0 mg/L (as PO4 3-)			

		Phosphate Resolution Low Range : 0.01 mg/L High Range : 0.1 mg/L Phosphate Accuracy Low Range : ±0.04 mg/L ±4% of reading High Range : ±1.0 mg/L ±4% of reading Phosphate Method Low Range : Adaptation of the Ascorbic Acid method High Range : Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Amino Acid method Phosphorous, Acid Hydrolyzable Range 0.00 to 1.60 mg/L (as P) Phosphorous, Acid Hydrolyzable Resolution 0.01 mg/L Phosphorous, Acid Hydrolyzable Accuracy ±0.05 mg/L or ±5% of reading Phosphorous, Acid Hydrolyzable Method Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-P E, ascorbic acid method. Phosphorous, Reactive Range Low Range : 0.00 to 1.60 mg/L (as P) High Range : 0.0 to 32.6 mg/L (as P) Phosphorous, Reactive Resolution Low Range : 0.01 mg/L High Range : 0.1 mg/L Phosphorous, Reactive Accuracy Low Range : ±0.05 mg/L or ±4% of reading High Range : ±0.5 mg/L or ±4% of reading Phosphorous, Reactive Method Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-P E, ascorbic acid method. Phosphorous, Total Range Low Range : 0.00 to 1.15 mg/L (as P) High Range : 0.0 to 32.6 mg/L (as P) Phosphorous, Total Accuracy Low Range : 0.01 mg/L High Range : 0.1 mg/L Phosphorous, Total Resolution Low Range : ±0.05 mg/L or ±6% of reading High Range : ±0.5 mg/L or ±5% of reading Phosphorous, Total Method Low Range : Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-P E, ascorbic acid method. High Range : Adaptation of the Standard Methods for the Examination of Water and Wastewate Potassium Range Low Range : 0.0 to 20.0 mg/L (as K) Medium Range : 10 to 100 mg/L (as K) High Range : 20 to 200 mg/L (as K) Potassium Resolution Low Range : 0.1 mg/L Medium Range : 1 mg/L High Range : 1 mg/L			

		Potassium Accuracy Low Range : ±2 mg/L ±7% of reading Medium Range : ±10 mg/L ±7% of reading High Range : ±20 mg/L ±7% of reading Potassium Method Adaptation of the Turbidimetric Tetraphenylborate method Silica Range Low Range : 0.00 to 2.00 mg/L (as SiO2) High Range : 0 to 200 mg/L (as SiO2) Silica Resolution Low Range : 0.01 mg/L High Range : 1 mg/L Silica Accuracy Low Range : ±0.03 mg/L ±3% of reading High Range : ±1 mg/L ±5% of reading Silica Method Low Range : Adaptation of the ASTM Manual of Water and Environmental Technology, D859, Heteropoly Molybdenum Blue method High Range : Adaptation of the USEPA Method 370.1 for drinking, surface and saline waters, domestic and industrial wastes and Silver Range 0.000 to 1.000 mg/L (as Ag) Silver Resolution 0.001 mg/L Silver Accuracy ±0.020 mg/L ±5% of reading Silver Method Adaptation of the PAN method Sulfate Range 0 to 150 mg/L (as SO42-) Sulfate Resolution 1 mg/L Sulfate Accuracy ±5 mg/L ±3% of reading Sulfate Method Sulfate is precipitated with barium chloride crystals Zinc Range 0.00 to 3.00 mg/L (as Zn) Zinc Resolution 0.01 mg/L Zinc Accuracy ±0.03 mg/L ±3% of reading Zinc Method Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Zincon method Wavelength Range 340 to 900 nm Wavelength Resolution 1 nm Wavelength Accuracy ±1.5 nm Measurement Modes Transmittance (% T), absorbance (abs), concentration with choice of units (ppm, mg/L, ppt, °f, °e, ppb, meq/L, µg/L, PCU, Pfund, pH, dKH, °dH, meq/kg or no measurement unit) Wavelength Selection automatic, based on the selected method (editable for user methods only) Optical System split beam sample and reference light detectors Wavelength Calibration internal, automatic at power-on, visual feedback Data Points Stored up to 9999 measured values Export Capability .csv file format, .pdf file format			

		Connectivity 1 micro USB port for charging and PC connectivity Connectivity (1) USB - A (mass storage host); (1) USB - B (mass storage device) Power Supply 15 VDC power adapter; 10.8 VDC Li-Ion rechargeable battery Battery Type/Life 3000 measurements or 8 hours Environment 0 to 50 °C (32 to 122 °F); 0 to 95% RH OEM authorization shouldbe compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
7.	**CO-HC Analyzer**	Large touch screen display Flexible, intuitive operation Bluetooth® wireless communications Quickly and easily stream data to smartphones & tablets Long-life O2 sensor (5 Year Warranty) Reduces maintenance cost and downtime Customizable reports for data viewing Easy compliance reporting and record keeping Standard Li-Ion Battery Operates > 12 hours; optional AA batteries or AC power Rugged, one step probe connection Easy to attach; exceptional durability Automatic Sensor Protection Protects sensors in the toughest combustion environments, extending life B-Smart Sensor Exchange Program Delivers pre-calibrated sensors to your door to eliminate field calibration and minimizes maintenance A combustion efficiency and environmental analyzer Measures up to gases simultaneously (minimum O2 and CO), Sensors are easily replaced or upgraded in the field Rugged suitcase design with large, easy-to-read display Built-in printer for instant traceability and record-keeping Measurements: O2 0 to 29% CO-H2 compensated 0 to 10,000 ppm CO (high range) 0 to 40,000 ppm NO 0 to 3,000 ppm NO2 0 to 500 ppm SO2 0 to 5,000 ppm	**01**		

SR NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
		Size (L x W x D, approx.) 10" x 3.8" x 2.5" (25.4 x 9.7 x 6.4 cm) Weight (approx.) 1.5 lbs (0.68 kg) w/Li-Ion battery pack Power Three options: Rechargeable Li-Ion battery, 4x AA or wall adapter (5V USB) Display 4.3 in. (10.9 cm) color touch panel LCD Run Time 12 to 14 hours (typical, w/included Li-Ion battery pack) Warm-up Time 60 seconds Fuels[1] Natural gas, coal, oil 2/4/6, propane, wood/biofuels, kerosene, biogases, digester gas, B5, pellets, KOKS, LEG, LPG, butane, wood chips Operating Conditions Temperature: 32 to 113° F (0 to 45° C) Humidity: 5 to 90% RH non-condensing Air Pressure: 1 atmosphere ±10% Position: Any Environmental Conditions Stack Temperature: -4 to 2192°F (-20 to 1200 °C) Ambient Temperature: -4 to 999 °F (-20 to 537 °C) Draft/Differential Pressure: ± 72 inch of H2O (± 179mB) Memory 500 sets of records Communications Bluetooth® 4.0, USB 2.0 (micro-B), IrDA OEM authorization shouldbe compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			

5. **Transportation Engineering Lab :**

1.	**Abrasion testing machine** **Los Angeles Abrasion Testing Machine**	**Los Angeles Abrasion Testing Machine** **IS: 10070-1982, IS:2386 (Part-IV)** The machine consists of following- (i) A hallow steel cylinder, closed at both ends, having an inside diameter 70 mm and an inside length of 500 mm, mounted on stub shafts about which the cylindrical drum rotates about a horizontal axis. (ii) A detachable shelf fitted inside the cylinder at a distance of 1250 mm from the opening measured along the circumstance in the opening measured along the circumstance in the direction of rotation. (iii) A ISI certified motor with reduction gear which runs the drum at 30-33 rpm It is desirable to equip the drive with a 'power supply cut-off type revolution counter which stops the machine after completing the specified number of revolutions, (iv) A tray with lifting handles are provided. (v) A revolution counter. (vi) The abrasive charge shall consist of 12 cast iron spheres 48 ± 2 mm in diameter and each weighing between 390 and 455 g and a total of 12 numbers of spheres weighing 5 000 ± 25 g shall be supplied. Machine suitable for operation on 440 V, 50 Hz, 3-Phase supply. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
2.	**Abrasion Testing Machine** **Deval Attrition Testing Machine**	Deval Attrition Testing Machine **IS : 2386 (part IV) - 1963** For determining the abrasion value of coarse aggregate. It consists of the following :- Two hollow cast iron cylinders closed at one end and fitted with tightly fitting covers at the other and mounted on a shaft at an angle of 30° to the axis of the shaft. The	**01**		

		cylinders are of 20 cm internal diameter and 34 cm deep. A shaft adjusted to rotate at 30-33 rpm by reduction gear mechanism operated by a motor. A revolution counter. Suitable for operation on 440 V, 50 Hz, 3 phase supply. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			
3.	**Dorry Abrasion Testing Machine**	Dorry Abrasion Testing Machine For determination of the resistance of aggregates to surface wear by abrasion. The apparatus comprises the following :- A circular disc mounted on a reduction gear driven by an electric motor at about 28-30 rpm. Two large trays for holding the sample. Two small trays for sample. Two conical hoppers for sand. Two sample try holders. Two sets of weights for loading the samples. A revolution counter. Suitable for operation on 220 V, 50 Hz, single phase supply. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		

4.	**Aggregate Crushing Value Apparatus**	Aggregate Crushing Value Apparatus (150mm) IS: 9376-1979 The apparatus should comply with IS9376-1979 and should be able to be used for measuring the resistance of an aggregate to crushing, and should consists of: 1) Cylindrical Cell 2) Plunger 3) Base Plate 4) Tamping rod 5) Metal Measure. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**05**		
5.	**Mechanical Sieve Shaker with IS: Sieves**	It should be compact design and light weight and mounted on a bench top. This eliminates the use of concrete foundation. Noise has been reduced considerably in the new model. A digital timer adjustable from 0-99 minutes is incorporated as an integral part of the equipment. The Sieve Shaker can carry upto 8 sieves of 20cm dia. It is driven by a ¼ HP geared motor. The Sieve Table is inclined from the vertical axis and the direction of inclination changes progressively in the clockwise direction. In addition to the gyratory motion of the table, there is a tapping motion as well. Should also supply Adapter for 30cm dia sieves Suitable for operation on 220 V, 50 Hz, Single Phase, AC supply IS 460-1962 are to used. The sieves for soil tests: 4.75 mm to 75 micron, Supplied complete with 7 set of sieves for course and fine aggregate Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**02**		

6.	**Redwood Viscometer No.1**	Redwood Viscometer No.1 (Electric operated) I P 70/62 counter For determining the viscosity of oils and waxy fuel oils as a time of flow in seconds. The No.1 Viscometer, is for oils having flow times in 30-2000 seconds range. The apparatus consists of silver plated oil cup provided with a cover. The oil cup has a precise stainless steel jet which can be closed by silver plated metal ball valve. A cylindrical copper water bath is fitted with a heating tube and a drain cock. The bath is mounted on a stand with levelling screws. Complete with a spirit level, a collar for thermometer, a stirrer with insulated handle and a 50 ml. Flask.	**01**		
7.	**Touch Screen Viscometer**	Machine should be compliance with ASTM standard • Using with Stepping Motor with Accurate, reliable operation • Direct readout of all measurement parameters • Auto Range Showing • Time Function for measurement • Sound alarm at under 20% Torque • Linear calibration • Wide range power supply:100V-240V Measuring Range(mPa.s)20-2,000,000 m.pas RPM0.3, 0.6, 1.5, 3, 6, 12, 30, 60 No of Standard Spindles #1,#2,#3,#4 is standard configuration ,(#0 is for option) Measurement Accuracy ±1.0% of range Repeatability ±0.5% Display should be in Large Crystal Display with Touch Screen Display Temperature RTD Monitoring Sensor Probe Yes Output RS 232 Interface Power Supply AC 220V/50Hz Weight less than 10 kg OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
8.	**Standard Tar Viscometer**	Standard Tar Viscometer (Electric operated) IS : 1206-1958 IP 72/58 For determining the viscosity of cut back bitumen and road tar. It has a cup known as 10 mm cup. The cup is a cylindrical brass tube with a dished bottom. An orifice is provided in the centre of the base which can be closed with a ball valve. A cylindrical copper water bath 160 mm dia x 105 mm with a side heating tube is mounted on a stand with leveling feet. A stirrer with a curved shield and four vertical vanes with an insulating handle and a thermometer support is provided. An auto transformer for controlling the temperature is provided. Suitable for operation on 220V, 50 Hz, single phase supply.	**01**		
9.	**Digital penetrometer**	**Conforms to the IS: 1203 – 1978 ASTM D 937, BS:4698** Specification:- (i) On the base, a vertical pillar mounted with levelling screws. (ii) The head along with dial plunger rod a cone slides on the pillar and can be easily clamped to the desired height.	**01**		

		(iii) It also carries the digital timer for controlling the penetration duration. (iv) For fine adjustment of needle or cone tip to sample comes with a rack and pinion and pointer assemble. (v) A clutch mechanism is incorporated which help to read the penetration and subsequently help in resetting a simple and accurate operation. (vi) The dial is graduated in 400 1/10 and the millimetre subdivisions with the needle pointer against the actual figures for easy reading. (vii) Comes with a bitumen penetration needle, two sample containers, and ring weight one every 50 gms and 100 gms lead screw gear arrangement, Spirit level, and a digital preset timer. (viii) The automatic timer supplies 220V, D.C. output for exactly 5 seconds to a timing head (built in electromagnet). The timer head allows the plunger rod to fall freely for 5 seconds and clamps it automatically after 5 seconds. Penetration Needle (2 sets) Transfer Dish made of copper. (2 sets) Aluminium Sample Containers (3 sets)			
10.	**Softening point test**	Ring and Ball Apparatus Electrical IS: 1205-1978 It consist of- (i) Two steel balls, each of diameter of 9.5 mm and weight 2.5 g ± 0.05 g. (ii) Two rings of depth 6.4 mm, inside diameter at top 17.5 mm, inside diameter at bottom 15.9 mm, outside diameter 20.6 mm. (iii) A metallic support is used for placing pairs of rings. (iv) A heat resistant glass container of 85 mm diameter and 120 mm depth. (v) Electric stirrer with stand and blades to gently stir water in the beaker. Single phase suitable for operation on 230 V , A.C.	**01**		
11.	**Film Stripping Device**	Film Stripping Device (Electrically Operated) For determining the resistance of bituminous mixture to stripping of the asphalt from aggregate particles and for judging the adhesive capacity of bituminous material. Applied to aggregate fraction passing 9.525 mm sieve and retained on No.8 Sieve. It consists of a disc on which four bottles are mounted. The disc rotates at a rate of 100 r.p.m. approx. The sample is kept in bottles and agitated for 15 minutes.The percentage of aggregate stripped is estimated by visual observation. Provided with a time switch. Suitable for operation on 220 V, 50 Hz, single phase supply.	**01**		

12.	**Ring and Ball Apparatus**	Ring and Ball Apparatus IS : 1205, IP:58/63 The determining the softening point of bitumen. The apparatus consists of two steel balls (9.5 mm dia), two tapered rings in brass, two ball centring guides, a ring holder and a bath 8.5 cm dia x 12 cm deep approx. with a heating unit, an energy regulator and a motorised stirrer. Suitable for operation on 220 V, 50 Hz single phase supply.	**01**		
13.	**Pensky Martens Flash Point (Closed and open) Tester (Electric operated)**	Pensky Martens Flash Point (Closed and open) Tester (Electric operated) IS: 1448 (Part 1) 1209, IP 34/58, ASTM D-93 For determining flash point of petroleum products (Above 49°C flash point range) It has a brass coil cup fitted with a heat resistance handle. The cup is provided with a lid which includes stirring device, a cover, shutter and a flame explosive device. The shutter is operated by a spring handle. A flexible shaft is provided in the hand operated stirrer. A Cast Iron stove is fitted with a metal top plate mounted on an upright member (Gas Manifold) and it feeds a needle valve controlled burner	**01**		
14.	**Cleveland Flash (Open) & Fire Point Apparatus (Electrically Heated)**	IS : 1448 P:69 ASTM D-92 and IP36/63 For determining the flash & fire points of petroleum products except oils and products having an open cup flash below 175°F. It has a Cleveland flash-cup in brass with an insulated handle, a metal heating plate with a circular opening covered by asbestos board, an electric heater with energy regulator, and a gas test jet assembly. Suitable for operation on 220V, 50 Hz, Single Phase supply. Cleveland Apparatus ThermometerRange -6° to +400°C for use	**01**		
15.	**Ductility Testing Machine**	Ductility Testing Machine with digital display & cooling arrangement Ref. Standards IS:1208, ASTM D113, AASHTO T 51 Designed to test three specimens simultaneously. The machine consists of a carriage moving over a lead screw. An electric motor driven reduction gear unit ensures smooth constant speed and continuous operation. The entire assembly is mounted with water bath completely encased in metal bound hardwood. It is equipped with an electric pump circulator and heater. The temperature is controlled by digital temperature controller. Two rates of travel i.e. 5 cm/min and 1cm/min are provided. Suitable for operation	**01**		

		on 220 V, 50 Hz, Single Phase, AC supply. Supplied with Ductility Mould, with Base Plate - 4Nos. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			
16.	**Benkelman Beam Apparatus**	Benkelman Beam For determining the deflection of flexible pavements under the action of moving loads. The apparatus consists of a 365 cm long aluminium beam in two halves arranged to give the lever arm ratio of 2:1. Provision is made for levelling the apparatus. An anvil and a probe are fixed in opposite directions on the beam. A buzzer is provided for removing friction in the bearings. For movement of the assembled beam to different test points on the same pavement and clamping, spring loaded clamp is provided. The beam can be levelled by fine and coarse adjustments provided for the purpose	**01**		
17.	**Automatic Bituminous Compactor(Electrically Operated)**	Automatic Bituminous Compactor(Electrically Operated)Specified in Ref. Standards – ASTM D 1559 The apparatus consists of a chain drive coupled to the motor through a gear box, and carries a locking device which lifts and releases the hammer through a specified height. Fitted with a counter which trips the motor automatically after 50 or 75 strokes as set on it. Suitable for operation on 220 V, 50 Hz, single phase supply.	**01**		
18.	**Marshall Stability Test Apparatus**	DIGI Modified Marshall Apparatus, 100kN Single Speed, New Model for 4"/6" dia sample Ref. Standards -ASTMD1559BS:598-197, EN-12697-34 The equipment is a tabletop loading frame, with adjustable crosshead mounted on columns attached to sturdy base. The forces applied are generated by a screw jack via a reduction unit with worm gears housed in the base casting. Motive Power is from an electric motor via a multi-vee drive belt and provides a platen speed of 50.8mm /min. Protection for both upward and downward travel The worm reduction unit is a grease packed on assembly and should not normally require lubrication <u>Salient Features:</u> Single Speed, Bench top load frame Max. loading capacity, 100 KN Geared Screw jack and Motor Drive Precise speed	**01**		

		Limit Switch Protection for both upward and downward travel Technical Specifications: Maximum Horizontal Clearance 470mm Minimum Vertical Clearance 250mm Horizontal Clearance 265mm Platen Diameter 133mm Platen Travel 25mm Platen Speed 50.8mm/min Rated Power 375W Dimension (I x w x h) 550×400×870mm Weight 60kg Supplied with the following: Marshall Load Frame Cap 100kN speed-50.8mm/min 1 No. Breaking Head Stability Mould 1 No. Compaction Mould Steel, cylindrical 3 Nos. Base Plate 3 Nos Extension Collar 3 Nos. Compaction Pedestal, Manual Operation, comprising a Steel Platecapped on a wooden post. A Mould Clamp is fitted to the top of the plate 1 No Compaction Hammer for use with Compaction Pedestal andMould, weight 4.5 kg with a free fall of 457 mm2 Nos. Sample Eject for 4" dia Sample 1 No. Breaking Head Stability Mould1No. Marshall Mould 152.4mm ID x 114.3 on high. 3 Nos. Base Plate for 152.4mm dia sample 3Nos. Extension collar for 152.4 mm dia sample 3 Nos. Compaction Pedestal for 152.4 mm dia sample 1 No. Compaction Hammer 10.21 kg x 457 mm drop 2 No. Sample Ejector for 152.4 mm dia Sample 1 No Digital Indicator 1No. Load Cell 100kN 1No. Displacement Sensor (LVDT) 50mm 1 No. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. The OEM must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The OEM should have executed/ implemented such type of work/ supply order at any govt. institutions/ central and state universities/ IIT/ NIT/ PSU/ Research Organization. The OEM should have at least two orders minimum of Rs. 20 lakhs or a single order of Rs. 45 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			

19.	**Proctor Compaction test apparatus**	Ref. Standard IS:10074 (Part VIII) Compaction Test Apparatus for heavycompactionwith Collar and Base Plate, made of Gunmetal for light compaction Supplied with the following: Mould 150 mm ID, 127.3 mm height 2250 ml volume Rammer 4.9 kg x 450 mm fall for light compaction test as per IS: 9198 Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
20.	**Standard Penetration Test Set**	Standard Penetration Test Set Ref. Standards IS:2131 , IS:9640 Standard Penetration Test is a powerful tool for measuring the penetration resistance of the ground and for relating it to the degree of compactness of cohesionless soil and consistency of cohesive soil. The results can be used for design of foundations. SPT is widely used for measuring the undisturbed strength of the soil and for assessing its resistance to liquefaction due to ground vibrations caused by earthquakes or other dynamic forces. The Standard Penetration Resistance is measured as the number of blows 'N' required to drive a split spoon sampler to a depth of 300 mm using a 63.5 kg weight falling freely through a height of 750 mm	**01**		
21.	**Plate Bearing Test Apparatus**	Ref. Standard IS: 1888 The Plate Bearing Test is essentially a model test of foundations. The apparatus consists of :- Hydraulic jack – 500 kN (50,000 kgf.) supplied complete with hand operated pumping unit having 150 mm dia pressure gauge and one 5 meter long metal or flexible connecting pipe with adopters – 1 set. Ball and socket assembly – 1 set Set of MS plates a. 600 mm x 600 mm x 25 mm – 1 No. b. 450 mm x 450 mm x 25 mm – 1 No.	**01**		

		c. 300 mm x 300 mm x 25 mm – 1 No. 'L' Bracket for Dial Gauge – 4 Nos. Connecting pipe set consisting of one 60 cm long & two 30 cm long extensions with nuts and bolts			
22.	**Field Density Kit**	Field Density Kit IS:2720 (Part XXIX) The kit consists of :- Cylindrical core cutter 100mm inner dia x 130mm long with bevelled cutting edge and having wall thickness of 3 mm. Steel dolley 100 mm inner dia x 25 mm high. Rammer with steel rod for driving the core cutter.	**01**		
23.	**Sand Pouring Cylinder**	Sand Pouring Cylinder, The apparatus is suitable for estimation of field density of fine, medium and coarsegrained soils, as per IS:2720 (part XXVIII) and consists of:- Sand Pouring Cylinder, 215 mm internal dia, with conical funnel and shutter. Calibrating container 200 mm inner dia x 250 mm high with 75 mm wide flange. Metal tray 450 mm square x 50 mm deep with a 200 mm dia hole at the centre	**01**		
24.	**Rapid Moisture Meter**	Rapid Moisture Meter conforming to IS :12175 Moisture content determination of soil is an important part of listing in the field of agriculture, civil engineering, pharmaceutical industry etc. Test is based on the chemical reaction between calcium carbide and moisture in the soil. The amount of gas formed is directly proportional to the moisture content which is indicated in terms of percentage on the pressure gauge.	**01**		
25.	**Infrared moisture meter**	Infrared moisture meter is fast, accurate, operates on 220Volts AC supply. It is completely automatic and provides % moisture loss through entire drying cycle. Heating arrangement consist of 250 watts heating lamp with a solid state power stat to control rate of drying and also temperature	**01**		
26.	**Relative Density Apparatus**	Relative Density Apparatus Primarily meant for determination of void ratio of cohesion less, free draining soils, in loosest and densest states as per IS: 2720 (Part XIV), IS: 10837. It consists of : (i) Vibrating table, suitable to work with 440V, 50 Hz. Three phase power supply. Vibration deck of size 750 mm square, vibrating at a frequency of 3600 vibrations / min under a 115 kg load and amplitude variable from 0.05 mm to 0.65 mm.	**01**		

			(ii) Cylindrical unit weight mould, 3000ml capacity. (iii) Guide sleeve with clamps. (iv) Surcharge weight with handle. (v) Surcharge base plate with handle. (vi) Cylindrical unit weight mould, 15000ml capacity. (vii) Guide sleeve with clamp for item. Surcharge weight with handle. Surcharge base plate with handle.				
S. NO	**ITEMS NAME**		**SPECIFICATION** Handle for surcharge weight. Metal calibration bar 75 x 300 x 3 mm. Dial gauge holder. Dial Gauge 0.01 mm x 50 mm one no	**QTY**	**UNIT PRICE**	**TOTAL PRICE INCLUDING GST**	
	1. BEAM	Apparatus consists of a three parallel bar suspension system with elastic beam at their upper and lower ends. The upper ends of the two outer		**01**			

6. Material testing Lab

S.NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL Price Including GST
1.	Beam	Apparatus consists of a three parallel bar suspension system with elastic beam at their upper and lower ends. the upper ends of the two outer	01		

6. Material Testing Lab

	APPARATUS	suspension rods are tied to a vertical wooden board while central suspension rod may be tied to the centre of another elastic beam supported at two outer ends only. Apparatus is supplied complete with a supporting stand and a set of weights.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
2.	**SIMPLE SUPPORTED BEAM APPARATUS**	Apparatus consists of a mild steel beam about 2.5cm x 3mm in cross section and 100cm long, pinned to two supports 70cm apart situated symmetrically. One of the ends can be fixed or given a known slope by applying a known moment at the end with the help of suspended loads. At the other end also a known moment can be applied. Vertical loads can be applied at various points along the span of the beam. A dial gauge (with a magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
3.	**DOUBLE DISC POLISHING MACHINE**	Diameter of Polishing Disc 200 mm Rotation Speed 1400 rpm Motor specification 180W Power Supply 1Phase/220V/50Hz Dimension 730 x 405 x 308 mm Cooling style With cooling system Standard Delivery 2pcs of polishing cloth Should be supplied measuring instrument with capability of Data Logging with BLE 4.0 wireless transmission, having flashlight function lightens and support NCV non-contact voltage senseOEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
4.	**CREEP TESTING MACHINE**	Creep and Rupture testing machine using state of the art technology. It combines high accuracy with long time reliability, essential qualities for modern day creep and stress rupture testing. Constructed for the discerning user, particularly those who appreciate the value of testing individual specimens, the model SCP- 50 has choice of load capacities: 50 KN. The STE-SCP machine has four chromium plated steel columns and substantial Upper and Lower Crossheads. The load frame is supported by a completely enclosed robust base unit which has four corner leveling feet and a protective fabricated top cover. The upper crosshead carries the lever assembly which includes a lockable counterbalance weight. There are hardened knife-edges at all fulcrums. By means of this lever arrangement, slotted incremental weights, carried by a weight pan/rod assembly, apply load through the test specimen. SCP-50 uses double lever and other capacity machine uses single lever arrangement. Accurate axial loading of the specimen is ensured by a co-planar knife-edged coupling, located at each end of the loading string. The loading string and furnace are aligned to the centre of the two front columns. The three-zone closed cylindrical furnace is attached to the front columns of the load frame by two pairs of guide blocks and has an integral counterweight mechanism which considerably eases the raising and lowering operation. When the furnace is raised there is complete accessibility for specimen replacement and extensometer/thermocouple attachment. The furnace can be supported in any position by a lockable clamp. Applications : • Creep testing at elevated temperatures • Stress to rupture • Stress relaxation	**01**		

		• Constant load test in compression The correct load is applied to the specimen when the lever is in the horizontal position. To reposition the lever manually, the loading string can be raised or lowered by rotating the chromium plated capstan hand wheel at the rear of the base unit. Through a 20:1 ratio worm gearbox and drive shaft, the lead screw connected to the lower loading bar can be adjusted up to its full travel of 100 mm. how ever, automatic lever leveling is highly recommended. Technical Specifications: Load range: 50 KN. Load application: by means of dead weights with lever with 10:1 ratio. Load measurement accuracy ±0.5% of indication Extension measurement: By means of high temperature extensometer of strain gauge type connected to specimen by means of ceramic rod and ceramic cord. Extension indicating accuracy ±1% Extension resolution: 1 micron. Furnace type Split type, Three zone , three controllers. Temperature range : 200-1000 deg cen. Specimen size: Up to 30 mm Temperature Accuracy: ±3 degree Software: Windows 10 based application software for continuous data logging Data Capture :Force, Displacement , Temperature, Extension Software Features : Simple Data Entry For New File Creation Previous Data File Open Or Save Data Capturing Export Data To CSV Format Force And Extension Count 10000 Max Power supply: 220 VAC, 50 Hz, 3Kw High Temperature Furnace: newly designed three-zone split type cylindrical furnace features ceramic fiber insulation structure. The heating elements are of Kanthal type and provide three heat zones for excellent control of temperature gradients and reliable continuous operation up to the specified maximum temperature. During the test the temperature is controlled directly by a thermocouple on the test specimen. The three-zone controllers incorporate the microprocessor based instruments which give three-term control and digital display. Proportional band, integral and derivative time constants, cut back and heat power limit are standard features. In addition, a range of test chamber assemblies is available for use inside the high temperature furnaces, thus allowing creep studies under hostile atmospheric conditions. With Standard Accessories Furness 1000 ^{0}C Highly sensitive and accurate electronic extensometer Specimen Holder Pull Rods (Round Specimen) Coupling & Pin Type Attachment For Flat Specimen Displacement Transducer With Micro Controller Based Panel and Sample Data Entry Software Module With Digital Temperature Indicator for Controlling Constant Temperature. Special notes: Manufacturer must have NABL accredited calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the			

		technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
5.	**HARDNESS TESTER**	Machine should be Wide range of controlled metals and alloys, Low sensitivity to the curative and roughness of surface, Monitoring of hardness change along the surface, Stable measurements independent from force and time of pressing the probe to the surface, Possibility of material identification in blank production, Control of "volumetric" hardness. Measurement Scales: HRA, HRB, HRC, HB, HV and HLD Accuracy : Rockwell 1.5 HRC Brinell 10 HB Vickers 12 HV Quantity of additional free scales – 3 Nos OELD COLOR DISPLAY Quantity of measurements for average reading calculation 1-99 selectable Memory capacity, readings 12400 PC Connection USB Power Supply LI-ion accumulator Weight of electronic unit 400gm or less Weight of D-probe 200 gm or less Hardness should be supply along with test block and D-type probe, CD with software, Cuff to fix device on arm, Bag for carrying and storing, Accumulator (pre-installed) and standard accessories. Special notes: Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid.	**01**		
6.	**COMPRESSION TESTING MACHINE**	Compression testing machine 2000kNwith automatic Pace Rate Controlled and Touch screen control panel with Computer & Printer, NABL calibration certificate Provided with Machine. Capacity: 2000KN Suitable for100 and 150mmcube and 100mmdia and 150 dia cylinder Resolution: 0.1KN Clearance between upper and lower platens(Max): 370MM Distance between side plates(Max): 360MM Platen size. (min.): 300sqr Ram stroke: 50MM The Machine should be suitable for: The compressive strength test for concrete cubes/cylinders as per IS-516/ASTM C39. Machine should conform to IS: 14858. Automatic Loading rate control. Should come with In-House National Accreditation Board for testing and calibration laboratories It should be operate able through color touch screen controller.	**01**		

		The machine should have an accuracy of ±1% from 10% to 100% of the maximum capacity. Should have Over load protection facility Should have Inbuilt SMPS for constant voltage Nearly noiseless operation. Machine should consist of: Enhance Digital indicator Control System It should facilitate Automatic Pace Rate Control, Data Logging, Data Printing, A pace rate bar on the display gives operator feedback on the loading rate. Unique storage –internal memory, export to USB and Wi-Fi based cloud storage possibility Configurable Engineering Unit for machine selection Predefined Machine Capacities for each engineering unit. Specific capacity can be selected from the drop down menu Flexible Calibration Points. Calibration can be done on 5 to 10 points Peak Load, Peak Stress, Unique Record No. is displayed EDI has provision to configure more than one mode User can set break point Data Download through USB in ASCII format Data storage upto 2000 records Peak Stress Calculation based on sample type and shape Password protection should be for system & calibration setup Loading rate should be adjustable Loading frame : It consists of a Loading Unit, an Electrically Operated Hydraulic Pump & an Intelligent Pace Rate Controller. The loading frame should be fully welded construction with a top crosshead, base, and solid side plates Precision ground hydraulic piston fixed to the base. Oil filled ball seating with heavy duty upper platen for increased stability The machine's platens are hardened, ground, and polished the upper platen should be self-aligning action Door Closed Safety feature 10.1 inch TFTLED backlit display with Resolution: 800x480(RGB) Metal door with a Perspex window should be available for Operator's safety Paint Should be Powder Coated Welding Should be High quality MIG and TIG Spacers should be provided for adjustment of the test height of the			

		sample Hydraulic pump unit: It should have full 3 term PID feed back control which uses a high torque DC Motordriven two-speed hydraulic pump to allows the fast approach of the platens, for daylight closure, and also allows the automatic, precise control over the load application and should be bonded strain gauge based Pressure transducer of 600 bar. Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.The OEM must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The OEM should have executed/ implemented such type of work/ supply order at any govt. institutions/ central and state universities/ IIT/ NIT/ PSU/ Research Organization. The OEM should have at least two orders minimum of Rs. 20 lakhs or a single order of Rs. 45 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
7.	**Universal Testing Machine**	Universal Testing Machine Computerized, 1000 kN, 6 pillar type with Hydraulic Jaws supplied with In House NABL Calibration Certificate, Indicator and Software **with** computer and printer **Salient Features** • 6 pillar structure with hydraulic jaw grips. • Strain measurement at variable speed to cover a wide range of materials adjustable by the manual control valve. • High reading accuracy and rugged design of digital display. • Robust load frame with extremely rigid construction. • Large effective clearance between columns enable testing of standard specimen as well as structures. • Loading accuracy as high as ±1%ofthe indicating value • Motor driven threaded columns for UP/DOWN movement of lower crosshead for quick change over of specimen, grips and attachment. • Simple control to facilitate ease of operation. • Clamping of jaws and specimen gap can also operate through remote control • Fully open front hydraulic wedge grips make it easy to insert and remove specimens for increased productivity and operator safety. **Supplied along with the Machine:** **For Tension Test** Clamping jaws for round specimens 8-16mm, 20-40 & 40-60mm - 1set each Clamping Jaws for Flat Specimens thickness 0-40mm – 1 set Flat specimen width – 70mm **For Compression Test** Pair of compression plates -233mm- 1 No Spherical seating facility for cube test	**01**		

		NABL Calibration certificate in compression mode **For Transverse Test:** Table with adjustable roller Width of roller -140 mm Diameter of roller- 50mm Maximum clearance between support – 600mm Radius of Punch Tops-16mm, 22mm – 1 No each Crosshead geared motor (kW) : 0.74kW Power pack motor (kW) : 1.49kW Weight (approx.): 3500 Kg. **Special Features:** Data analysis and reporting software for UTM – 1No Automatic switching mode: Machine shall be automatically switched off on overload or over travel or specimen break or manual termination of test or at pre-defined load/extension Safety features: Over load protection and Over travel protection **Technical Specifications:** Type: 6 pillar/Column type Load frame Capacity: 1000kN Sample Griping system: Hydraulic Load Resolution: 0.01kN Elongation Scale Resolution: 0.1mm Extensometer Resolution: 0.001mm Max Clearance for Tensile Test: 50-650mm Max Clearance for Compression Test: 0-600mm Effective Clearance between Columns: 650mm Ram Stroke: 250mm Straining/piston speed at no load: 0-50mm/min Control: Manual Load Control Software: Data analysis and reporting software Special notes: Manufacturer must have NABL accredited testing and calibration facility Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.The OEM must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The OEM should have executed/ implemented such type of work/ supply order at any govt. institutions/ central and state universities/ IIT/ NIT/ PSU/ Research Organization. The OEM should have at least two orders minimum of Rs. 20 lakhs or a single order of Rs. 45 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
8.	**Autodesk AutoCAD One 2021**	**Autodesk AutoCAD One 2021** (One Year + Single User) Include AutoCAD Mechanical AutoCAD Electrical AutoCAD MEP AutoCAD Architecture AutoCAD Map3D	**05**		

7. Mechanical Workshop (Production Practice & Basic Mechanical Engineering Lab)

S. NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	ARC WELDING	THREE PHASE INVERTER BASED, HIGH EFFICIENCY AND HIGH POWER FACTOR DC WELDER 1) Suitable for long distance welding and cellulosic electrodes 2) Enhanced reliability due to SMD technology 3) Capable of welding with all types of cellulosic electrodes including 6010, 7010g and 8010g 4) High frequency IGBT based rectifier 5) Arc force adjustment on panel. 6) Tig welding possible with external hf unit 7) Light weight, compact and portable for easy handling 8) Capable of welding with 100 meter + 100 meter welding and return cables 9) Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage SALIENT FEATURES: ❖IGBT based latest PWM inverter technology ❖High efficiency ❖High OCV and suitable for cellulosic electrodes. ❖Smooth and stable arc with minimum spatter ❖Controls provided for adjustments of arc force ❖Tig operation possible with external HF TIG control unit. PROTECTIONS WITH AUTO RESET: ❖Input supply voltage protections for over and under voltage ❖Over temperature ❖Protection against single phasing INPUT SUPPLY: ❖Voltage: volts. 415 , +15%, -10% ❖Phase: no. 3 ❖Frequency :hz 50/60 ❖Max. Input kva @ 415v supply : ❖@ 100% duty cycle kva 14 ❖@no load kva 0.24 ❖Power factor upto 0.93 ❖Efficiency % ≥ 85 OUTPUT ❖ Open circuit voltage ❖ Volts 85 v dc ❖ Welding current range amps 10-400 ❖ Welding current (40°c) ❖ @ 60% duty cycle (10 minute cycle) amps 400 ❖ @ 100% duty cycle amps 310 GENERAL ❖ Suitable for welding electrode size mm ø 2.5, 3.2, 4, 5 and 6.3 mm ❖ Arc force setting adjustable by potentiometer ❖ Current display (set current and actual current) a 3 digit –7 segment digital panel meter ❖ Ingress protection ip23 ❖ Cooling class forced air ❖ Insulation type h ❖ Welding output terminals class stud type for lug type cable connections ❖ Dimensions l x w x h mm 660 x 305 x 530 ❖ Weight (approx.) Kg 40	01		

		Vendor should be supply Complete Set With Torch, Regulator, Flow Meter, Heater, Hose Pipe, Hose Clamp Earth Clamp with Copper Cable, Gas trolley with four wheel for easy to movable and gas cylinder 7 Cubic with gas. Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
2.	**TIG WELDING**	THREE PHASE INVERTER BASED, HIGH EFFICIENCY AND HIGH POWER FACTOR PULSE TIG/ MMA DC WELDER 1) Useful for wide variety of material types and thickness. 2) Full featured tig controls possible 3) Hf ignition 4) Intelligent protection: over/under voltage, over current / temperature 5) Water cooled torch with water cooling unit option. SALIENT FEATURES 1) Latest pwm inverter technology 2) High efficiency (> 85%) 3) Smooth and stable arc with spatter less welding 4) Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage INPUT ❖ Supply voltage, phase, frequency volts, ac 415 v +15%, -10%, 3 phase, 50 / 60 hz ❖ Max. Input kva @ 415 v supply ❖ @ 100% duty cycle kvamma mode - 7.5, tig mode - 7.0 ❖ @ no load mma mode - 0.19, tig mode - 0.19 ❖ Power factor upto 0.93 ❖ Efficiency % 82 - mma mode, 77 - tig mode OUTPUT ❖ Open circuit voltage @ 415v input supply volts, dc 70 v dc (+/- 5 v) ❖ Welding current range amps, dc mma mode 50 - 250, tig mode 5 - 300 ❖ Welding current at 40 deg c, 10 minute cycle ❖ @ 100% duty cycle amps, dc mma mode - 195, tig mode - 230 ❖ @ 60% duty cycle mma mode - 250, tig mode - 300 GENERAL ❖ Welding electrode size (mmamode) dia. In mm 2.5,3.15,4 ❖ Protections : over voltage, under voltage, single- phasing, over temperature ❖ Front panel functions 1) mma/ hf tig / lift arc tig selection switch 2) 2t/ 4t/ spot/cycle selection switch 3) pulse/ normal mode selection switch 4) normal/ foot switch selection switch 5) menu switch for selecting all functions for pulse - gas pre flow, gas post flow, pulse frequency, current upslope time, current down slope time, welding current (peak current for pulsing mode), background current (for pulsing mode), set current time - as per selected mode of operation 6) mains on 'green' colour indication 7) trip 'red' colour led - machine is under protection mode. 8) encoder for selected parameter increment / decrement 9) remote connector 10) gas out 11) water / gas cooled selection switch	**01**		

		12) torch switch connector 13) foot switch connector 14) cam-lock output connectors ❖ Cooling type forced air ❖ Ambient temperature rating °c 40 ❖ Class of insulation - h ❖ Degree of protection - ip23s ❖ Dimensions l x w x h (without handle) mm 610 x 295 x 480 Vendor should be supply Complete Set With Torch, Regulator, Flow Meter, Heater, Hose Pipe, Hose Clamp Earth Clamp with Copper Cable, Gas trolley with four wheel for easy to movable and gas cylinder 7 Cubic with gas) Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
3.	MIG WELDING	it is a multiprocessors welding outfit with inverter based welding power source. 1) THE IGBT power module, high frequency transformer and fast recovery diode are used as key device for power conversion and transmission to assure better efficiency and performance. 2) The welding power source has both constant current (cc) and constant voltage characteristics (cv), which are suitable for MMA and MIG/MAG and FCAW applications. 3) Set output parameters are constant against input supply variations. 4) Power source is protected against single phasing, under voltage, over voltage, short circuit and temperature rise. 5) MMA process with this outfit is most suitable for all kinds of electrodes including CELWEL for fabrication work, pipe welding, site construction etc. 6) GMAW process is suitable for welding in semiautomatic/automatic mechanism for welding ms, ss and al materials with solid and flux core wires (FCAW mode). 7) Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage 8) it can operate with single point synergic control in MIG/MAG mode. 9) the complete system consists of power source, wire feeder, torch and inter connecting cables and control cables between wire feeder and power source salient features: the salient features of the equipment are: ❖ Latest inverter based technology. ❖ High efficiency (>85%). ❖ Single point synergic control in GMAW. ❖ Protections against over and under input supply voltage & single-phasing and overheating of power components. ❖ User friendly digital front panel and digital remote controller with display. ❖ Auto "weld stop" when welding torch is taken away from work piece. ❖ 2t, 4t and spot and multi spot operating modes in MIG mode as well as FCAW mode. ❖ dynamic inductance adjustment in GMAW process and arc force adjustment in MMA process for better arc control ❖ Crater voltage and crater current adjustment through digital panel. ❖ Unique feature of pinch-off pulse to avoid globule formation. ❖ Built in VRD (voltage reducing device) unit (optional) in SMAW	01		

mode only.

- ❖ error code digital display on front panel – for easy fault diagnostics

protections with auto reset:
the equipment is provided with following protections:
under / over input supply voltage:
1. red led glows if input supply voltage goes below 330v ac.
2. red led glows if input supply voltage goes above 480v ac
No output voltage will be available in both conditions.
over temperature trip:
if the temperature of the semiconductor component is increased above safety limits then machine goes in safety mode (trip mode). in this condition welding voltage will not be available and welding will stop.
single phasing protection:
if any one of three phases of input supply (r, y, b) is absent, then machine will trip and red led will glow. in this condition welding voltage will not be available and welding will stop.
output short circuit protection:-

- ❖ WELDING output is protected against any short circuit.

details of complete system:

- ❖ wire feeder FEEDLITE 40 (NEM)- c
- ❖ torch HIPRO 403 (e) / MTG 400 (e)
- ❖ gas pressure regulator cum flow meter
- ❖ argon or co2 regulator
- ❖ gas heater

110 v ac, in case of co2 regulator

error codes display:
the following error codes are displayed on the digital read out for easy diagnostics

1 : nominal input voltage v ac 415 v ,3 ph
2: input voltage range v ac 415 (+15% - 10%)
3 : phase no. 3
4 : frequency Hz 50-60
5 : efficiency @ 100 % duty cycle % > 85
6 : power factor @ 100 % duty cycle 0.82 max
7 : open circuit voltage in MMA mode @415v, 3 phase v dc 84 v
open circuit voltage in MIG mode @415v, 3 phase 55 v
open circuit voltage in TIG mode @415v, 3 phase 84 v
8 : welding current range in MMA mode a dc 50-400
welding current range in TIG mode 10– 400
welding current range in MIG mode 40– 400
9 : welding current @ 100 % duty cycle (10 minute cycle) a dc 310
welding current @ 60 % duty cycle (10 minute cycle) 400
10 : input power (in mma mode) @ 100 % duty cycle kva 12.0
input power (in mig mode) @ 100 % duty cycle 11.0
input power (in tig mode) @ 100 % duty cycle 9.0
11 : crater current range in mig mode - 50 – 400 a
12 : crater voltage range in mig mode - 14-40 v
13 : cooling type forced air
14 : class of insulation class h
15 : degree of protection - ip23
16 : protections auto resettable - over voltage, undervoltage, single – phasing, over temperature
17 :suitable welding electrode size dia. - in mma mode mm 2.5, 3.2 , 4, 5, 6 mm diameter
18 :suitable wire size dia. - in mig mode mm 0.8, 1.0, 1.2, 1.6 mm diameter
19 : dimensions l x w x h mm 650 x 450 x 570
20 : auxiliary outputs on back panel v ac 110 v ac, 110 va – gas heater
21 : front panel functions -

		• MMA /TIG/ MIG /FCAW process selection MIG / FCAW mode • welding / crater current, welding / crater voltage adjustment through encoder. • separate switches to check OCV, gas flow & wire inch. • selection switches for wire DIA, material & gas for synergic application. • welding mode 2t / 4t / spot / multisport selection switch. • auto/manual selection switch. • save & recall switches to save & recall 10 programs. • facility to set prelaw, post flow burn back, spot & pause time before welding. • 3 digits digital display for voltage and current MMA / TIG mode • current setting by encoder • encoder for arc force setting with on/off facility switch only in mma mode. 22 :remote control - remote control with cable for setting voltage and current 23 : mounting wheels of the power source - wheel mount front: swivel, rear: fixed 24 : lifting arrangement - handle provided 26 : weight (approx.) kg 52 Vendor should be supply Complete Set With Torch, Regulator, Flow Meter, Heater, Hose Pipe, Hose Clamp Earth Clamp with Copper Cable, Gas trolley with four wheel for easy to movable and gas cylinder 7 Cubic with gas, Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
4.	**GAS WELDING MACHINE**	Gas welding machine, with accessories: Supplied with complete Welding Helmet, Hand Screen, Black Glass, White Glass, Cable Clamp ,Welding holder Chipping Hammer ,Wire Brush ,Gas Welding Trolley with movable 2 in 1, ,Oxygen Cylinder 7 Cubic with Regulator, D. A. Cylinder 7 Cubic with regulator ,Cutting torch ,Welding torch, Hand Screen, Flame Nipple (any size), Welding goggles , Apron (Leather) ,Filler wire M.S.,Flux ,Electrode , Welding cable 20 meters , Hand Gloves , M. S. Plate (4mm) 2x2Feet Size. S. Plate (8mm) 2x2Feet Size, Acetylene horse pipe- 12 meters, Oxygen Horse Pipe- 12 meters, Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage. Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
5.	**LATHE MACHINE**	ALL GEARD LATHE MACHINE 6 FT 1) Height of Centre 160-200mm 2) Swing Over Bed 340mm 3) Swing Over Slide 180mm 4) A.B.C 1000MM 5) Width of Bed 240 mm 6) Bore 40 7) Nose Threaded 8) Speed-8 R.P.M 9) Cross Slide 175mm	**01**		

		10) Top Slide 125 mm **11)** Lead Screw TPI 4 **12)** Tail Stock Sleeve Mt 3 **13)** Power Required 1 hp **14)** Thread Per Inch 4 To 60 **15)** Thread Per mm 0.5 to 7.5 **16)** Chuck 8" thru and motor 1 hp Vendor should be supply along with necessary attachment and accessories vendor/OEM should machine will be fixed on the floor through fasteners OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
6.	**LATHE MACHINE**	Lathe Machine V- BELT TYPE 6FT **1)** Length of Bed 6' **2)** Height of Centre 175 mm **3)** Width of Bed 240 mm **4)** Bed Type 2v-2Flat **5)** Swing Over Bed 340 mm **6)** Swing Over Slide 180 mm **7)** Spindle Nose MT-5 **8)** Spindle Bore 40 mm **9)** Spindle Speed No 8 (4+4) **10)** Spindle Speed Range 60-650 **11)** Metric Thread No 0.5-7 **12)** Lead Screw 4TPI **13)** Admit Between Centre 1000 mm Vendor should be supply along with necessary attachment and accessories, Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
7.	**DRILL MACHINE**	BENCH DRILLING MACHINE **1)** Drilling cap in steel 32 mm **2)** Distance between column to centre 250 mm **3)** Spindle travel max 150 mm up to down **4)** Morse taper mt-3-4 **5)** No. Of speed 4 & 8 **6)** Column dia 75 mm **7)** motor Vendor should be supply along with necessary attachment and accessories, Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
8.	**Mechanical workshop Interactive Learning / Teaching Systems**	The interactive learning program „Metal Removal 4"describes the automated production process milling. The general structure, axis directions and parameters of the milling machine are described, along with the most commonly used types. The structure and cutting edge geometry of milling cutters are described; the differences among various types of milling cutters are explained by means of cutting edge characteristics and application examples. Tool and Work piece Clamping, exercises in determine cutting parameters and 3D animations of the milling procedures clarify the milling process. Countermeasures for the prevention of accidents and environmental damage are discussed and practiced. The Course Objectives helps in the retention of learned material. A test of the course objectives is finishing the content of the training program.	**01 Set**		

Processing time: approx. 4,5 hours (total)
Milling Machines

Structure

Parameters

Types

Milling Cutter

Cutting Edge Geometry

Wear

Milling Cutter Types

Milling Process

Determining the Cutting Parameters

Holding the Tools

Holding the Work Pieces

Metal Removal 5 - Single License (10579)

The interactive learning program „Metal Removal 5"describes the automated production process grinding.
The structure and function of the surface grinder, the cylindrical grinder and machine tools for grinding are presented. Grinding tools are described according to their structure and characteristics and their selection is illustrated and practiced using examples. The balancing, clamping and dressing of grinding wheels are described, along with working techniques and procedures. Animations are used to reinforce the descriptions. Countermeasures for the prevention of accidents and environmental damage are discussed and practiced. The Course Objectives helps in the retention of learned material.
A test of the course objectives helps to remember the content of this chapter.
Processing time: approx. 4,5 hours (total)
Grinding Machines

Structure of the Horizontal Surface Grinder

Structure of the Universal Cylindrical Grinder

Types of Grinding Machines

Grinding Tools

Structure and Properties

Shapes

Designation of Grinding Wheels

Grinding Process

Determining the Cutting Parameters

Clamping and Balancing Grinding Wheels

Dressing Grinding Wheels

Metal Removal 6 - Single License (10580)

The interactive learning program „Metal Removal 6"covers the manual and automated production processes for the generation of threads.
The application and generation of threads are explained and

practiced, along with thread designations. Thread types are classified and described according to their distinguishing characteristics. Preparatory tasks and calculations for the production of internal and external threads are presented in detail and practiced. The most common manual and automated production processes are presented by means of examples and thread inspecting is explained. Countermeasures for the prevention of accidents and mistakes are discussed. The Course Objectives aids in the retention of learned material.
A test of the course objectives is finishing the content of the training program.
Processing time: approx. 3 hours (total)
Structure of the Thread

Application and Generation of Threads

Thread Designations

Thread Types

Threads for Fastening and Adjusting

Metric ISO Standard and Fine Threads

Right and Left Hand Threads

Single and Multiple Start Threads

Thread Manufacture

Dimensions for Internal and External Threads

Cutting and tapping threads by hand

Cutting threads with the lathe and milling machine

Thread Inspection

Metal Removal 7 - Single License (10581)

The interactive learning program „Metal Removal 7" describes the basic terminology of metal removal using machine tools and covers cutting tools, cutting tool materials and the metal removal process.
The basic terminology for metal removal using machine tools is explained. The distinguishing characteristics of cutting tools are described. The requirements of cutting tool materials are explained and overviews of the various cutting tool materials and index able inserts are presented. Clamping devices for tools and work pieces are presented, along with various cutting fluids. The execution of metal removal is clarified by means of working techniques, results and procedures. The Course Objectives aids in the retention of learned material.
A test of the course objectives supports the remembering of the topics.
Processing time: approx. 3,2 hours (total)
Basic Terms

Procedures

Motions

Cutting Tools

Cutting Edge Geometry

Cutting Tool Material

Requirements

Overviews

Index able Inserts

Process

Preparing Work Pieces

Preparing Cutting Tools

Cutting Fluid

Working Technique

Results

Metal Removal Procedures

Process Planning - Single License (10584)'

The interactive learning program „Process Planning" contains the subjects blue print reading, technical communication and developing manufacturing plans.

Here you will find instruction on how to read, understand and utilize the various specifications and illustrations found in engineering drawings. Various types of engineering drawings, plans and diagrams are introduced, along with the applicable standards and drawing equipment. How to obtain the drawings and information needed for process and assembly plans is explained and practiced, along with determining adjustment parameters. The Course Objectives aids in the retention of learned material.
Processing time: approx. 4,5 hours (total)
Blue Print Reading

Views

Dimensioning

Tolerance Designation

Surface Characteristic Designation

Cross Section Representation

Thread Representation

Simplified Representations

Technical Communication

Standardization

Means of Communication

Drawing Equipment

Developing Manufacturing Plans

Preparation

Process Plans

Assembly Plans

Documentation

Testing Module - Single License (10585)

The „Testing Module" is comprised of the Course Objective questions from all modules of the Metal Working Series and allows for the gene-ration of subject-specific and multi-subject examinations.

		The Testing Module allows both trainers and trainees to document the knowledge acquired through use of the learning programs. Trainers can create tests manually, by hand-picking questions, or automatically, using various selection protocols. The tests can be stored for use by the trainees. The trainees' test results can be viewed and printed out. In addition to taking tests prepared by the trainer, trainees can generate self-examinations automatically. Trainer Subject pre-selection Question selection: All subjects Particular number of randomly selected questions Particular number per exercise type Manual selection Saving prepared tests Calling up and printing out test results Trainee Taking tests prepared by the trainer Taking self-examinations Subject pre-selection Question selection: All subjects Particular number of randomly selected questions Particular number per exercise type Separating / Forming - Single License (10574) The interactive learning program „Separating and Forming" describes manual and automated procedures for cutting, bending and straightening. Various cutting procedures are illustrated with descriptions of their distinct features and tools. Bending, straightening and other forming procedures are explained and clarified by descriptions of the corresponding tools and machines, as wells the necessary process steps. The Course Objectives aids in the retention of learned material. A test of the course objectives supports the remembering of the topics. Processing time: approx. 3,5 hours (total) Separating Blade Cutting Cutting with Opposing Blades Shearing Thermal Cutting Occupational Safety Forming Bending Straightening Other Procedures			

Objectives aids in the retention of learned material.
Controlling of the course objectives is strengthening the training targets.
Processing time: approx. 4 hours (total)
Dimensional Tolerances

Basic Terms

ISO Tolerance System

Inspection Dimensional Tolerances

Fits

Types of Fits

Systems of Fits

Selecting Fits

Inspecting Fit Dimensions

Geometric Dimensioning & Tolerance

Geometric Tolerances: Blue Print Specifications, Types, Inspecting Geometric Tolerances Positional

Tolerances: Blue Print Specifications, Types, Inspecting Positional Tolerances

Coordinate Measuring Machine (CMM)

Joining 1 - Single License (10582)

The interactive learning program „Joining 1"encompasses positive and friction joining, as well as the procedures for bonding and soldering/brazing.
The distinct features, tools and working techniques of the various positive and friction joints are explained on the basis of the connecting elements utilized. The configuration of bonded joints, various adhesives, and the bonding process are described. Soldering and brazing processes are clarified and the various procedures, tools and filler metals are discussed. The Course Objectives aids in the retention of learned material.A test of the course objectives are finishing the content of the training program.
Processing time: approx. 5,5 hours (total)
Threaded Fastener Joints

Threaded Fasteners and Nuts

Designations

Thread Locks

Tools

Process

Pin and Bolt Joints

Pin Types and Process

Bolt Joints

Rivet Joints

Rivet Types

Tools

Process

Shaft and Hub Joints

Key, Gibb and Profile Joints

Bonded Joints

Adhesives and Process

Soldered / Brazed Joints

Tools

Solder/Brazing Filler Metal and Fluxes

Process

Joining 2 - Single License (10583)

The interactive learning program „Joining 2" describes the welding process .Along with a description of welding gases and equipment for Oxy fuel Gas Welding (OFW),
the welding process itself is explained in detail, on the basis of torch selection and adjustment and the working techniques used. The necessary fundamentals of manual shielded metal arc welding (SMAW) are described. The selection of electrodes and the determination of welding current are discussed and practiced. Various gas shielded arc welding procedures are introduced with emphasis on gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW). The necessary equipment is described. The Course Objectives aids in the retention of learned material. A test of the course objectives helps to remember the content of this chapter.
Processing time: approx. 6 hours (total)
Oxy fuel Gas Welding (OFW)

Welding Gases

Welding Equipment

Welding Supplies

Process

Manual Shielded Metal Arc Welding

Arc Welding Power Sources

Work Place

Welding Supplies

Electrode

Process

Welding Defects

Gas Shielded Arc Welding

Shielding Gases

Gas Metal Arc Welding (GMAW)

Gas Tungsten Arc Welding (GTAW)

Welding Defects

Metal Removal 1 - Single License (10575)

The interactive learning program „Metal Removal 1"describes manual metal removal production processes.
The learning program „Metal Removal 1"contains a description of the cutting wedge – the basic form of all cutting edges – as well as

the cold chisel. Preparation procedures, such as scribing and layout punching, are presented, along with the required tools. The production procedures sawing and filing are explained in detail on the basis of the tools used, chip formation, processes and working techniques. Animated processing examples and exercises illustrate the interrelationships. Each production process description concludes with the accident prevention regulations specific to it. The Course Objectives aids in the retention of learned material.
A test of the course objectives supports the remembering of the topics.
Processing time: approx. 3,5 hours (total)
Cutting Wedge

Metal Removal Process

Cutting Edges, Surfaces and Angles

Cold Chisel

Lay Out Work

Scribing: Scribing Tools

Layout Punching: Layout Punch, Execution

Sawing

Saw

Process

Types of Saw Cuts

Filing

File

Process

Processing examples

Metal Removal 2 - Single License (10576)

The interactive learning program „Metal Removal 2"describes automated metal removal production procedures for the generation and processing of drilled holes.
The various tools and machines used for drilling are explained. Exercises in determining cutting parameters reinforce learning and 3D animations show detailed sequences of the drilling procedures. Counter boring & countersinking contains the various countersinks and counter bores, as well as an explanation of the process of counter boring & countersinking itself. The topic reaming includes determining cutting parameters, as well as a description of reamers and reaming process sequences. The necessary regulations pertaining to accident prevention and the operation of the machines are presented. The Course Objectives rounds off the contents of the learning program.
A test of the course objectives is finishing the content of the training program.
Processing time: approx. 3 hours (total)
Drilling

Definition

Drilling Tools

Drilling Machines

Drilling Process

		Counter boring & Countersinking Definition Counter bore & Countersink Counter boring & Countersinking Process Reaming Definition Reamer Reaming Process Metal Removal 3 - Single License (10577) The interactive learning program „Metal Removal 3"describes the automated production process turning. The structure and parameters of the lathe are described, and the most common types are presented. The cutting geometry and structure of the turning tool are explained and the use of different types of turning tools is illustrated by means of application examples. Tool and work piece clamping, exercises in determine cutting parameters and3D animations of the turning procedures clarify the turning process. Countermeasures for the prevention of accidents and environmental damage are discussed. The Course Objectives aids in the retention of the learned material. A test of the course objectives helps to remember the content of this chapter. Processing time: approx. 4 hours (total) Lathe Structure Parameters Types Turning Tool Structure Cutting Edge Geometry Chip Types Types of Turning Tools Turning Process Determining the Cutting Parameters Clamping the Tool Clamping the Work piece Working Technique Turning Procedures Process Planning Vendor OEM supplied with Suitable PC for Above software and Original license Make: Christiani/Googoltech/Siemens OEM authorization should be compulsorily attached with the technical bid.			
9.	**MILLING MACHINE**	Milling machine **1)** Table length & width (mm) 800x175 **2)** No. Of t-slots/size 3 x 12	**01**		

		3) Swivel 45 degree + - 4) Travel x y z (mm) 475x170x400 5) Range of spindle speeds 40-700 6) Spindle taper iso - 40 7) Arbor diameter(mm) 27 8) Qull movement - 9) Feed horizontal 2 10) Electricals 11) Motor spindle 2 h.p. 12) Coolant pumps motor 0.1 h.p. Vendor should be supply along with necessary attachment and accessories Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners.OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
10	**SHAPING MACHINE**	1) Maximum working stroke 24" 2) Length of ram 53" 3) Ram bearing in column 32" 4) Ram bearing width 12" 5) Tool slide traverse 8" 6) Distance from table to ram 16" 7) Minimum distance from table to ram 2" 8) No. Of speeds 4 9) Horizontal traverse of table 28" 10) Table top surface 24" x 15" 11) Power required 2 h.p.motor Vendor should be supply along with necessary attachment and accessories, Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
11	**SLOTTING MACHINE**	1) Adjustable stroke 10 to 250 mm 2) Longitudinal movement 230mm 3) Cross movement speed 230 mm 3 speed 4) Ram adjustment 250 mm 5) Electric motor 1 h.p. 6) Weight (aprox) 410 kg Vendor should be supply along with necessary attachment and accessories, Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners. OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
12	**PEDESTAL GRINDER**	PEDESTAL GRINDER HP1/3 Phase2800 RPMPEDESTAL GRINDER with Grinding Wheels Size 10" x 3/4", 2 No. Wheel (one fine & one coarse) at each end, fitted with wheel guard, tool rest &cast iron leg. Vendor should be supply along with necessary attachment and accessories Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners.OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		
13	**HACKSAW MACHINE**	HYDRAULIC HACKSAW MACHINE 12" Cap. Hydraulic Control Hacksaw Machine having Blade Size 20" x ¾" Complete with Vice, Motor 2 hp Pulley, Adjustable Stop Rod & Brackets for Motor Fittings Round Cutting 300 & square cutting 250 is capable. Machine is capable for blade size is	**01**		

		500x38mm. Vendor should be supply along with necessary attachment and accessories Instruction manuals to be provided for all equipment and the experiments to be conducted, vendor/OEM should machine will be fixed on the floor through fasteners.OEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,			
14	**Hand Grinder with 10 Grinding Wheel specimen**	Specification 4 inch Wheel capacity etc. No Load Speed: 11000 rpm Grinding spindle thread M 10 Disc Diameter: 100 mm Wire cup brush, diameter 70 mm Item Weight: 1.8 Kg	**01**		
15	**Bending Machine**	Specification 7 feet sized up to 22 gauge Specimen GI Sheet(22 gauge Manual BendingOEM/Suppliers should have ISO & CE certified Manufacturer.OEM authorization should be compulsorily attached with the technical bid OEM should have the Authorized Service Center in the State of Rajasthan,	**01**		

8. Tom & Vibration Lab :

S. NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**UNIVERSAL VIBRATION TEST RIG**	Capable for 11 Experiments in single study frame apt for conducting various experiments such as single pendulum, compound pendulum, bifilar suspension for determination of M.I., spring mass system with damped vibrations and others. Range of Experiments: 1. Simple Pendulum 2. Compound Pendulum 3. Bifilar Suspension for determination of M.I 4. Spring mass System with damped vibrations 5. Spring mass System with undamped vibrations 6. Equivalent Spring Mass System 7. Torsional Vibrations Single Rotor 8. Torsional Vibrations Two Rotor 9. Forced Vibrations Lateral 10. Single rotor Viscous damping 11. Dunkerly's System	**01**		
2.	**Single slider crank mechanism & double slider crank mechanism**	**Single slider crank mechanism & double slider crank mechanism** 1. Model of Crank & Slotted Lever App. Fully Calibrated , 2. Scotch Yoke Mechanism , 3. Oldham Coupling , 4. Elipse Tracer Model .	**01 Each**		
3.	**Models of Gear train system**	**Models of Gear train system** Models of spur, helical, bevel, rack and pinion, worm gears and gear train (spur), epicyclical gear train (sun and planet type), differential gear	**01 Each**		
4.	**Steering Mechanism Apparatus**	**Steering Mechanism Apparatus** Steering Mechanisms; Davis and Ackerman.It should specially made dissectible for demonstration purpose,	**01**		
5.	**Quick return mechanism setup**	**Quick return mechanism setup** quick return mechanism and draw velocity and acceleration diagram	**01**		
6.	**Computerized wheel balancing machine**	**Computerized wheel balancing machine** Professional DSP Wheel Balancer with 15.5" LED monitor and Icon based touch pad, suitable for 10"-24" rim dia and maximum 65 kg wheel weight. Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage • Suitable for Car and LCV wheels • LED Monitor • Static and Dynamic balancing • Simultaneous display of Inner and Outer plane results • Five modes of Alloy wheel functions • Two modes of measurements – Normal and Fine • Unbalance recalculation • Self checking, on-line ERROR display facility • Dimension setting in "INCH" or "MM" • Unit conversion in "grams" / "ounces" • Self calibration • Automatic distance input mechanism • Automatic start with Wheel guard closure	**01**		

		• Split weight mode (Spokes Program)
		• Automatic measurement of Rim diameter
		• Automatic measurement of Rim diameter and Rim width
		• Optimization program
		• Spin count
		  • Maximum wheel weight 75 kg
		  • Maximum wheel diameter 39" (990 mm)
		  • Maximum wheel width 21" (533 mm)
		  • Rim diameter 10" to 24" (254 mm to 610 mm)
		  • Rim width 1.5" to 20" (38 mm to 508 mm)
		  • Rim distance By distance measuring rod 4 mm to 174 mm By keypad entry 4 mm to 550 mm
		  • Resolution Fine mode 1 gm Normal mode 5 gm
		  • Minimum unbalance detection Fine Normal Rim diameter up to 16.3" 4 gm 10 gm Rim diameter above 16.3" up to 24" 9 gm 20 gm
		  • Maximum unbalance measurement 300 gm
		  • Accuracy 1 gm
		  • Position Accuracy ± 1°
		  • Balancing speed 200 RPM
		  • Spin time Min. 12 sec.
		  • Power supply 230V ±10% AC, Single Phase, 50/60Hz
		  • Power 0.5 HP
		  • Ambient temperature 0°C to +50°C
		  • Humidity RH below 90% Non condensing
		Supply along with measuring instrument with capability of Data Logging with BLE 4.0 wireless transmission, having flashlight function lightens and support NCV non-contact voltage sense. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			

7.	**Sliding mesh automobile gear box**	**Sliding mesh automobile gear box** **Demonstration Model**	**01**		
8.	**Motorized Gyroscope Apparatus**	**Specification:** • Disc rotor – 30 cm dia, 10 mm thick approx. • Drive – AC/DC Single phase motor. Fractional HP 6000 RPM. • Overall Size – 30 cm base diameter, 5 cm height • Approximate weight – 30 kg.Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range of Experiments:** • Observation of Gyroscope behavior (Two Laws of Stability) • Experimental justification of the equation T= I. W. WpOEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
9.	**Static and Dynamic Balancing Apparatus**	**Specification:** • Drive Motor – F.H.P. Universal motor. • Balancing Weights – 6 nos. with different sized drills for varying the unbalance • Cord and container system with precision steel balls for relative weight measurement. Supplied with measurement device having big size display, meter should be phone size	**01**		

		design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range of Experiments:** • Static Balancing of system using steel balls. • Dynamic balancing of a simple rotating mass system. • Observation of effect of unbalance in a rotating mass system. **OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan**			
10	**Universal Governor Apparatus**	**Specification:** • Drive unit- D.C. Motor 0.5 H.P., 0-1500, RPM 220 V. D.C. • Speed Control Unit working on single phase. • Belt and Pulley system to give spindle speed 100 to 500 RPM. • Governor mechanisms with necessary springs and weights.Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range Of Experiments:** • For all types of Governor, a) Determination of characteristic curve of sleeve position against Speed of rotation. b) Derivation of the actual controlling force curves from the above Characteristic. Porter and pronell Governors. The effect of varying the mass of the centre sleeve. • Hartnell Governors. Effect of varying the spring. • OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
11	**Cam Analysis Machine**	**Specifications:** • Cams: Tangent, Eccentric, Circular Arc. • Followers : Roller, Knife edge, Mashroom • Drive : D.C.-0.25 HP 0-1500 RPM. • Speed Control Unit : A Dimmer stat of 2 Amp capacities, Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range of Experiments:** For the combination of cams and followers provided, the following tests Can be conducted. • Plotting the lift-angle of rotation curve. (Cam profile) • To study the effect of follower weight (W) on the speed of bounces. • To study the effect of initial spring compression on the speed of bounce. • Follower bounces (jump) can be observed by using a stroboscope. **OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan**	**01**		

12	**Whirling Of Shaft Apparatus**	**Specifications :** • Shafts made from steel & of the following nominal dimensions. **Dimensions in mm | Length in mm** 4.76mm or (3/16)" | 900 or (36) 6.35mm or (1/4)" | 900 or (36) 6.35mm or (1/4)" | 900 or (36) • Drives 'PROMPT' make single phase AC/DC fractional HP 6000 RPM. • Dimmerstat for controlling of speed. **Range of Experiments:** Display of the various modes of whirl for a range of shafts with – • Both ends DIRECTIONALLY FREE • One end FIXED and the other FREE. Modes of vibration can be studied & the frequency can be measured in each case. Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
13	**Journal Bearing Apparatus**	**Specifications:** • Journal Bearing - 70mm dia (Nominal) 75mm dia. • Weights - 4 adjustable weights. • Recommended oil - SAE 10 • Motor - D.C. shunt wound Speed 1500 RPM in both the directions • Control Unit - Special design. • Manometer Panel - 16 tubes mounted on a M.S. board.Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range of Experiments:** • **Simple Demonstrations:** Observation of the pressure profile at the various conditions of load and speed. • **Experimental Investigation:** After noting the pressure profile for any chosen conditions the following analysis may be conducted. a) Plotting the Cartesian and polar pressure curves. b) Plotting the theoretical Summer field curves. • OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
14	**Epicyclic Gear Train & Holding Torque Apparatus**	**Specification:** • 1HP D.C. Motor, 1500 RPM • Voltmeter 0-300 V, Ammeter 0-5 Amp • RPM indicator, Dimmer 4 Amp • Spring Balance 0-10 Kg.Supplied with measurement device having big size display, meter should be phone size design with voltage alert alarm with flashlight. Capable for measure the freq and voltage **Range of Experiments:** • To measure epicyclic gear ratio between input shaft and	**01**		

		output shaft (Actual and Theoretical). • To measure input torque, holding torque and output torque. • **OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan**			

9. Thermal Engineering Lab :

S. NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	SINGLE CYLINDER DIESEL ENGINE TEST RIG	Engine Test Setup Single cylinder, Four stroke, Diesel The setup consists of computerized single cylinder, four strokes, Diesel engine connected to eddy current type dynamometer for loading. It is provided with necessary instruments for combustion pressure and crank angle measurements. The setup enables study of engine performance for brake power, indicated power, frictional power, BMEP, IMEP, brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, A/F ratio and heat balance. Lab view based Engine Performance Analysis software package "Engine soft" is provided for on line performance evaluation. A computerized Diesel injection pressure measurement is provided. Online measurements and performance analysis, IP, IMEP, FP indication, systems feature is: Combustion analysis, PΘ-PV plots, performance plots and tabulated results, Data logging, editing, printing and export, Valve timing diagram study, Configurable graphs, pressure volume plot and indicated power software can serve most of the engine testing application needs including monitoring, reporting, data entry, data logging. The software evaluates power, efficiencies, fuel consumption and heat release. It is configurable as per engine set up. Various graphs are obtained at different operating condition. Supply along with measuring instrument with capability of Data Logging with BLE 4.0 wireless transmission, having flashlight function lightens and support NCV non-contact voltage sense. Specifications:- Engine- Make Kirloskar, Model TV1, Type 1 cylinder, 4 stroke Diesel, water cooled, power 5.2 kW at 1500 rpm, stroke 110 mm, bore 87.5 mm. 661 cc, CR 17.5 Dynamometer- Type eddy current, water cooled Propeller shaft- With universal joints Air box- M S fabricated with orifice meter and manometer Fuel tank- Capacity 15 lit with glass fuel metering column Calorimeter- Type Pipe in pipe Piezo sensor- Range 5000 PSI, with low noise cable Crank angle sensor- Resolution 1 Deg, Speed 5500 RPM with TDC pulse. Data acquisition device- NI USB-6210, 16-bit, 250kS/s. Piezo powering unit- Model AX-409. Temperature sensor- Type RTD, PT100 and Thermocouple, Type K Temperature transmitter- Type two wire, Input RTD PT100, Range 0–100 DegC, I/P Thermocouple, Range 0–1200 Deg C, O/P 4–20mA Load indicator- Digital, Range 0-50 Kg, Supply 230VAC	01		

		Load sensor- Load cell, type strain gauge, range 0-50 Kg Fuel flow transmitter- DP transmitter, Range 0-500 mm WC Air flow transmitter- Pressure transmitter, Range (-) 250 mm WC Software- "Engine soft" Engine performance analysis software Rota meter- Engine cooling 40-400 LPH; Calorimeter 25-250 LPH Pump- Type Mono block Supplied along with Computer &Printer, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. Preference will be given to ISO/ CE certified Manufacturer/Bidder who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
2.	**MULTI-CYLINDER PETROL ENGINE TEST RIG**	Multi cylinder, four strokes, petrol engine test setup(Computerized) Engine: Make Maruti, Type BS-VI, 3 Cylinder, 4 Stroke, Petrol (MPFI), water cooled, Power 48 kW @ 5500 rpm or better, Type K10B, Torque 85 Nm @ 3500 rpm or better, Bore @ 70 mm x Stroke @ 75 mm, 990 cc or better, CR 11.0:1 with catalytic converter. Dynamometer: Type eddy current, water cooled with loading unit. Dynamometer power 80 kW or higher, speed 5000 RPM or better. It must be equipped with load cell type weighing mechanism with microcontroller based digital torque indicator. Dynamometer controller: It should ensure the operation of dynamometer at It should also include safety trip features: low cooling water pressure, high water outlet temperature and engine overload setting. It should have programmable control with constant torque and constant speed operations. Propeller shaft: With universal joints HHSL Balanced, cover mounting Air box: M S fabricated with suitable orifice meter and manometer with zero adjustment span. Fuel tank: Capacity 15 lit with glass fuel metering column Calorimeter: Type Pipe in pipe with glass wool insulation Piezo sensor: Combustion and Fuel Line Pressuremeasurement:Piezo sensor with charge amplifier, Intermittent pressure 15000 PSI, Sensor range (±5V Output) 5000 PSI or more, Sensitivity: ±0.1mV/psi or higher, Non linearity 2% of FS or less, Resonant frequency: 350 kHz or higher with low noise cable Crank Angle Encoder: Heavy duty optical incremental encoder with 360 PPRresolution with TDC marker. This should provide one index marker pulse per revolution. 5-30VDC, Suitable powering and pulse converter. Temperature range: –20°C to +70° C, Speed range: 6000 m-1 or more, axial cable. Data acquisition device: NI USB-6210-6218, 16-bit, 250kS/s, 16 analog input, 8 digital input and 24 I/O lines, analog and digital triggering, programmable I/P range, custom configurable, maximum output up-to 10V. Temperature sensor and Transmitter: Type RTD, PT100 and Thermocouple, Type K.Type two wire, Input RTD / Thermocouple, Output 4–20 mA, Also, oil temp measurement and control. Temperature Range:0-1200°Cfor engine Exhaustand 0-100°C for water inlet/outlet Load sensor: Load cell, type strain gauge, range 0-50 Kg, 3 mV/V	**01**		

		output, Alloy steel, non-linearity ±0.025 %FS or less, operating temp: -10 to 70 degC Fuel flow transmitter: DP transmitter, Range 0-500 mm H2O, output 4-20mA, supply: 10 to 24VDC, Process temperature limit -40 to 120 0C Air flow transmitter: Pressure transmitter, Range: 0 to 25 mbar, IP67 standard, 10 to 30 VDC supply, Output: 4-20mA, Non linearity <0.2%FS. Rotameters are provided for cooling water and calorimeter water flow measurement Rotameter: Engine cooling 40-400 LPH; Calorimeter 25-250 LPH Pump: Type Monoblock (for providing water supply to engine setup) Software:Labview based software with default, and custom configuration facility. Capable of all performance and combustion plots online and offline mode. Custom configurations of sensor and scale should be available. Also, provision of altitude, humidity, room temperature and engine variables factors configurations. All factors should incorporate into results of performance and combustion characteristics. Report generation in word and excel formats. Data export, edit, print facility. Performance Analysis:The setup should enable study of engine performance for engine torque, brake power, indicated power, frictional power, BMEP, IMEP, brake thermal efficiency, indicated thermal efficiency, mechanical efficiency, volumetric efficiency, specific fuel consumption, air flow rate, fuel flow rate, A/F ratio, heat balance sheet, lube oil temperature analysis, Morse test, observation and results sheet as well as comparative performance graphs. Workable with offline configurations facility. Combustion analysis: Cycle to cycle variations up-to 100, P-Θ, P-V Plots, Log PV, combustion noise, rate of pressure raises, combustion fraction in mass fraction burnt, mean combustion gas temperature, fuel line injection pressure plots. Manual excel programming for manual mode experimentations Range of experiments to be performed: Study of Morse Test(Manual as well as Computerized) Study of performance characteristics with observations, results table and graphs. Provision to import and export of data and plots. (Computerized mode) Study of engine combustion characteristics Study of heat balance sheet Study of cycle to cycle variations plots Study of P-Θ, P-V Plots, fraction burn, combustion noise plots and tables Manual excel programming for manual mode experimentations Online as well as offline analysis Lube oil temperature analysis Supplied complete with Computer and printer, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. Preference will be given to ISO/ CE certified Manufacturer/Bidder who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
3.	**REFRIGERATION TEST RIG**	The set up demonstrates the students about the basic principal of a vapour absorption refrigeration cycle. The test rig is designed for the study of thermodynamics of vapour absorption refrigeration cycle by measuring temperature at different position. Experimentation/Learning Objectives • To Calculate Co-efficient of performance (C.O.P).	**01**		

		Utilities Required • Electric supply: Single Phase, 220 V AC, 50 Hz., 32Amp MCB with earth connection. Earth voltage should be less than 5 volts. • Floor area: 1 m x 0.5 m. Technical Details • Sealed Circuit : The System has no moving parts at all, which makes it silent and very durable. • Refrigerant : (NH3) + Water (H2O) • Mode of System : Externally heated by electric resistance heater • Evaporator : Coil Type evaporator • Volume of Cabinet : 40 Ltrs. • Electrical Rating : 65 Watts, Electrical Consumption in 24 Hrs. – 0.8 kWh. • Temperature Sensor : RTD PT-100 Type • Control Panel comprises of : Digital Voltmeter : 0-500 V Digital Ammeter : 0-19.99Amp. Temperature Measurement: Digital Temperature Indicator with multi-channel switch. With mains indicator, Standard make On-off switch etc • All Other accessories like Hand shut off valves, filter drier and Thermostat (Danfoss make) will be provided. • An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. • The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			
4.	**HEAT PUMP TEST RIG**	Heat Pump is a device to pump heat from one source to another. The heat obtained by heat pump is more than that could be obtained by direct electrical heating. The apparatus consists of refrigeration system with water cooled shell and coil type evaporator and condenser. SPECIFICATIONS: 1.Compressor – Hermetically sealed compressor using R-12 refrigerant, having capacity 0.3 tons of refrigeration. Condensing pressure – max. 15 Kg/cm2 (Actual pressures will depend upon working conditions). 2.Condenser – Shell and coil type with continuous water flow arrangement. 3.Evaporator – Shell and coil type with continuous water flow arrangement. 4.Expansion Valve – Internally equalized thermostatic expansion valve. 5.Measurements – a) Rotameter for condenser & evaporator water flow rate measurement. b) Rotameter for liquid refrigerant flow measurement. c) Pressure gauges for condensing and evaporating pressure – 2 Nos. d) Thermometer for refrigeration cycle & water temp, measurement – 7 e) Wattmeter for compressor input measurement. f) Ammeter for compressor current measurement. 6.Controls – a) HP/LP cutout for compressor. b) Overload protector for compressor. c) Gate valve to control water flow rates. d) Necessary switches and fuse. A technical manual is accompanies the unit.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		
5.	**WINDOWS AIR CONDITIONING TEST RIG**	Compressor: - Hermetically sealed compressor having cooling capacity of (as per water cooler) Condenser: Air cooled condenser made up of copper pipe &Aluminum fins Evaporator: - cooling coil. Capillary Tube: Diameter : suitable Material : copper Heater : 300 watts Thermometer : Wet / Dry Type	**01**		

		Thermostat : 5 degree C to 15 degree C Pressure &Vacuum Compound gauge : any available brand Temperature Measurement : Digital Temperature indicator is provided to measure temperature of refrigerant and water Temperature sensor: RTD PT-100 Type Voltmeter : 0-300 V Ammeter : 0-5 A Energy Meter : Single Phase Standard make On/Off switch, Mains Indicator etc. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan			
6.	**SEPARATING AND THROTTLING CALORIMETER.**	THROTTLING CALORIMETER It consists of two concentric chambers, the inner chamber and the outer chamber, which communicates with each other through an opening at the top. As the steam discharges through the metal basket, which has a large number of holes, the water particles due to their heavier momentum get separated from the steam and collect in the chamber. The comparatively dry steam in the inner chamber moves up and then down aging through the annular space between the two chambers and enters the Throttling Calorimeter. Experimentation/Learning Objectives • To find the dryness fraction of steam. Utilities Required • Electric Supply: Single Phase, 220 V, 10 Amp. • Continuous Water Supply : 10 LPM Approx. at ½ kg/cm2 pressure Technical Details • Separating Chamber : Compatible capacity made of Stainless Steel insulated with Ceramic wool with water level indicator. • Heat Exchanger : For condensing steam • Steam Generator : Compatible capacity with digital temperature controller to control the temperature inside the steam generator. • Differentual pressure: By manometer measurement • Steam pressure measurement: By Pressure gauge • An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. will be provided along with the Apparatus. • The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan	**01**		

10. Power System Lab :

S.No.	Item Name	Specification	Qty	Unit Price	Total Amount Including Tax
1)	Generating station design: Design considerations, basic schemes and single line diagram of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations.	Display Material size 20" X 30" Duly laminated printed on heavy GSM Litho paper with proper supports on both ends 1) Hydro power station 2) Nuclear Power Station 3) Thermal Power Plant 4) Overhead insulators 5) Electrical traction	one Set of 1 each		
)	Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.	* DC Generator source - Two wire or three wire - ±100V * Provisional for variable DC voltage * Simulation of Long / Medium / Short distribution line. * Second DC generator source at distance end or ring main simulation * Provision to simulate Various feeders on the line. * Provision to connect loads at variable line locations. * Measurement of voltage and current at any point on the line segments * Provision for 8 Ammeters and 4 voltmeters Microcontroller based display with digital signal processing. * Calculation of maximum and minimum regulation and verification in DC Generator Source / Ring - Main Simulation current rating 2A or more, Other requirements: Adequate number of patch cords, connecting leads, Good quality, reliable terminals, sockets required at appropriate places on panel for connections, observations. Strongly supported by lab manual and diagrammatic representation, detailed operating instructions.	1		
4)	Design an EHV transmission line Sending end and receiving end power circle diagrams.	Three Phase Transmission line trainer Educational Bench Module incorporated with the following Power System modules with 1KW rating and Line – Line 440 volt Operation and with simulated transmission lines equivalent of 400 KV Electrical Power Transmission Line Training System Consists Of: 1. Generating Station Module 2. Artificial Transmission line module for400 KV 3. Static VAR Compensation Module 4. Fixed VAR Compensation Module 5. Receiving Station Module 6. RL Load.	1		

		Technical Details as below: 1. Generating Station Module (Power Transformer): Input Voltage : 415V, 3Phase, 50Hz. Output Voltage : 55-110-220-330V Line to Line. Current rating : 2.5A with tap changing switch for voltage regulation. 2. Artificial Transmission line module for400 KV Type : Artificial Transmission line 3Phase Bench Model. No. of Pi Sections : 18nos. Operating Voltage : 55-110-220-330V, Line to Line Current Rating: 2.5A Short Circuit Strength: 5A Line simulation through Iron cored inductor. Each pi-section for every 30Kms. 3. Static VAR Compensation Module FC – TCR act as load end compensator. This unit gives the smooth variation ofReactive power compensation. Improves the voltage profile and Variac act as tapchanging transformer. 4. Fixed VAR Compensation Module This consists of shunt capacitors for voltage control and series reactor to reduce the fault current at the time of occurrence of fault Specification Shunt capacitor: 3ϕ delta connected shunt capacitor of 500VAR to 1500VARCompensation under loading condition Shunt reactor with inductor variation available for compensation under no loadcondition. Series reactor with inductor available in all the three phases for series compensation toimprove the system stability. 5. Receiving station module (Power Transformer): Input Voltage : 55-110-220-330V Line to Line Output Voltage : 415V Line to Line Current rating : 2.5A with tap changing switch. With Over current and Over / Under voltage protections. 6. RL Load. * R Load 1 KW. Resistive Load with Selector Switch * L Load 1 HP 3Φ Induction Motor with Mechanical Load			
5)	Substations: Types of substations, various bus–bar arrangements.	Display Material size 20" X 30" Duly laminated printed on heavy GSM Litho paper with proper supports on both ends 1) Types of Sub Stations 2) Distribution networks	1		
6)	Electrical equipment for substations. Study high voltage testing of electrical	100 KV AC DC Test set Complete System Requirements 1. Different modes of connection are applied with each device so as	1		

	equipment: line insulator, cable, bushing, power capacitor, and power transformer. Flash over voltage testing of insulators.	to generate accordingly AC and DC 2. The system applies for education tests, allowing the students to see clearly the structure and components. 3. Components of the system include: 3.1 Console, including switch, on-off switch, regulator output voltage indicator, charging current indicator, over-current protection. 3.2 Testing transformer 10kVA/100kV 3.3 Rectifier, resistor, protective resistor, 3.4 Impulse weakly damped capacitive divider, DC resistive divider 1. CONTROL PANEL : Control panel which is built with 100 KV AC Meter / 140 KV Meter, Digital Timer , selector tripping devices , 32 Amp single phase motorized dimmer required contactors, necessary push buttons, and indicators with name plates Required Power Supply : 230V 32A Supplied along with measuring device with built in 20MHz Function Generator Bandwidth : 50MHz Number OF Channel : 2Analog Channel Sampling RATE : 1GS/s all Channels Time Base Rang : 5ns/div to 50sec/div Memory Depth b: 100kpts Acquisition Rate ≥50,000 per Second Input Impedance : 1 MΩ±2% /16pF±3 Pf VERTICAL Sensitivity : 500μV/div to 10 v/div Vertical Resolution : 8Bits Display :≥7inch FRA –Frequency Response for Bode plot Digital Voltmeter and Frequency Counter : Digital Voltmeter and 5-digit frequency counter upto scope bandwidth available Automatic Measurement : training signal : Different type of training signal available built in with lab guide , tutorials and content on Oscilloscope Fundamentals Function Generator : 20MHz function Generator with 20Vpp Square ,Pulse Ramp & 12Vpp sine wave with			

built in Wave gen to sweep from 20Hz up to 20Mhz

FRA –Frequency Response for Bode plot

Passive Probes : 2 Passive Probe provided

Serial Decodes (Optional) : I2C and UART Option available for future upgradable (optional)

PC Connectivity : USB Connectivity

Warranty : Standard 3 year warranty

NABL accredited calibration lab and service center in india and hard copy authorization certificate will be submit along with

2. HIGH VOLTAGE TRANSFORMER

Testing transformer rated input voltage should be 415V, rated output voltage should be 100kV, and rated capacity should be

10kVA, PD less than 5pC.

Transformers are made from CR sheet with duly fine epoxy finish of paint.

Oil drain valve is provided.

New technology FRP insulator is provided for the HV terminal.

Corona ring is provided to minimize the corona effect of the HV.

Terminals are identical.

3. EPOXY FRP SUPPORTING PILLER

It should be high quality epoxy fiber glass pillar which is used for hold the rectifier horizontal without any flashover between live part & ground.

4. RECTIFIER

It is using for convert the AC volts to DC VOLTS. It is designed &

manufactured using high stability & high voltage diodes. A multiple diodes are used for rectifier to withstand rated Voltage without any stress or damages. Across diode high quality & high voltage capacitor & resistors are used to avoid most AC ripples.

5. CAPACITOR FILTER

It is a RC filter to use for filter the DC rectified output voltage.

High voltage, high quality capacitors used for this filter multiple capacitors which is connected across resistor also is connected together in series. Put in oil immersed high quality epoxy pipe.

		6. RESISTANCE DIVIDER It is use for measure the O/P of the high voltage DC. High quality high voltage resistors are used & immersed on high quality epoxy tube which is filled with high quality oil. 7. SPHERE GAP ASSEMBLY For Absolute measurement of high voltage sphere gap assembly should be provided. 8. CAPACITOR DIVIDER It is for measure the high voltage AC. High quality &high voltage capacitors are used for both HV &LV.HV is connected to the HV point & LV is connected to the high impedance multi meter. This is read the LV voltage of the divider.			
		Below different types of insulators – 5 Each Pin Insulator. Suspension Insulator. Strain Insulator. Stay Insulator. Shackle Insulator.	1 set		
8)	Study filtration and Treatment of transformer oil.	The plant will be suitable for carrying out following operations: 1. Degassing, Dehydration and filtering transformer oil under high vacuum. 2. Filling of treated oil in to transformer tank. 3 Filtration and Dehydration of transformer. 4. The plant will be capable of attaining the following oil parameters in 3/5 passes. A. Breakdowns voltage with 2.5 mm electrode gap- 50-70kV B. Moisture content- upto<5ppm c. Neutralization value- < 0.05mg of KOH/gm of oil d. Particle size (filtration level) - < 1 micron e. Gas content - up to 0.1% by volume The plant will be mounted on caster while (pneumatic) & the casing shall be provided with doors of CRCA sheets, hinged on fabricated framework, angles and channels to have access to the operational controls and inspection and shall be fully caster while mounted and shall be weather proofed and shall be suitable for outdoor use. The plant components will have adequate strength and rigidity to withstand normal conditions of handling & usage. The plant will be mobile mounted. Strainer: It will be a metallic strainer with magnet fitted in it. It will remove magnetic and suspended particles to protect the inlet pump from damage due to abrasive particles. a. Rating - 1mm b. Flow – 250GPH (1200 Lph) Inlet Pump Details: Positive Displacement type Rotary Gear Pump with following specification: a. Flow Rate – 250GPH (1200Lph) b. Suction – 5Meters c. Provided with - Automatic Pressure By pass, flow control value. d. Gearpump coupled with Electric motor of rating 1HP, 3Phase, and 415volts. e. The electric motor should be ABB/CG/Siemens and any other ISI marked.	1		

		Inspection and Testing : The machine will be inspected and tested at the manufacturer site by the Department representative before dispatch of the machine. OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 20 lakhs or a single order of Rs. 35 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
9)	Determine dielectric strength of transformer oil.	It should be self contained compact and portable sets giving smooth variable output voltage from 0 to 60 KV. These testers should be designed for testing the die-electric breakdown strength of insulating liquids. Technical specifications: Input:0-230V Output:0-60kv Capacity: 20Ma. Component specification: Main On/Off switch and one main ON indicator (1 Nos) Increase Decrease switch (1 Nos) H.T. ON Off push button switch (1 Pair) H.T. ON indicator (1 Nos) H.T. OFF indicator (1 Nos) K.V. Voltmeter 60Kv (1 Nos) Motorized Variac (Dimmer) (1 Nos) Center earthed High voltage molded transformer (1 Nos) Operation/Working should be Automatically synchronous motor driven and manual operation provided with knob .Circuit will trip as per the dielectric strength of the oil. Transformer HV step up transformer encapsulated in epoxy resin. Capacity of transformer 2 KVA intermittent. Centre tap of HT Winding earthed.Distortion free magnetic design for output voltage.	1		

		Control Voltage controller interlocked at its minimum position so that HV switched ON only when thevoltage controller is zero and transperate hood is shut. HT ON, HT OFF, Main knob, Main Motor and Motor Direction Switch. Indicating Lamp of different colourfor Mains On, HT ON, HT OFF on front panel of instruments. Oil Cups Made of Methyl Methacrylate and removable electrodes. Electrodes Brass Polished spherical electrodes mounted on horizontal axis, can be set to gap of 2.5 mm Accessories Oil Test Kit is supplied along with plastic hood, 1 Oil cups without electrodes, Srew Driver, Oil Stirrer, 1 No. GO/NO GO Guage, Spanner, Instruction and operational manual, different type of Insulating Oil Brake down capacity, details chart as per ISS, resin dust cover & wiping cloth.			
10)	Determine capacitance and dielectric loss of an insulating material using Schering bridge.	**Features** • Touch LCD screen display. • Calendar chip and large storage inside. Save testing result according to time order, check history record and print the result. • The instrument data can be exported through U disk, and can be used to view and manage the data through the software on PC. • Multiple testing mode, with modes of inside high voltage, outside high voltage, inner standard, external standard, GST/UST, self-excitation. High voltage(more than 10kV) dielectric loss test can be made in the situation of external standard outside high voltage. • Test full sealed CVT (Capacitive Voltage Transformer) C_1 and C_2 dielectric loss and capacitance at the same time. Also test CVT transformation ratio and voltage angle difference. • The dielectric loss and capacitance value of C0 in the upper end of CVT can be measured by using the reverse shielding method. • High speed sampling signal. Inverter and sampling circuit inside are digitized controlled. Output voltage is adjusted continuously. • LCR automatic measurement. Inductance, capacitance, resistance can be measured and displayed. • Multiple protection of input voltage fluctuation, output short circuit, over-voltage, over-current, temperature, secure and reliable. Meanwhile, it has the function of grounding testing, that voltage boost is not permitted for non-grounding equipment. • No need to dismantle HV lead to measure dielectric loss and capacitance of CVT. • Frequency can be changed into 50Hz, 47.5Hz/52.5Hz, 45Hz/55Hz, 60Hz, 57.5Hz/62.5Hz, 55Hz/65Hz. **Specifications** Working condition -15°C~40°C RH<80% Anti-interference principle: Frequency conversion Power supply | AC 220V±10% | Generator can be	1		

				used.			
		High voltage output	0.5KV~10KV	Every 0.1kV			
			Accuracy	2%			
			Max. current	200mA			
			Capacity	2000VA			
		Self-excitation power	AC 0V~50V/15A	45HZ/55HZ 47.5HZ/52.5HZ 55HZ/65HZ 57.5HZ/62.5HZ Automatic dual frequency			
		Resolution	tgδ: 0.001%	Cx: 0.001pF			
		Accuracy	Δtgδ: ±(reading*1.0%+0.040%)				
			ΔC x: ±(reading*1.0%+1.00PF)				
		Measurement range	tgδ	Without limit			
			C x	15pF < Cx< 300nF			
			10KV	Cx< 60 nF			
			5KV	Cx< 150 nF			
			1KV	Cx< 300 nF			
			CVT test	Cx< 300 nF			
		LCR measurement range	L>20H(2kV)	R>10KΩ(2kV)			
		LCR measurement accuracy	0.1%	Angle resolution	0.01		
		CVT ratio range	10~10000				
		CVT ratio accuracy	0.1%				
		CVT ratio resolution	0.01				
		Memory capacity	200 groups, USB flash disk storage is supported.				
11)	Power System Simulation Study of short term, medium term and long term load forecasting.	**ETAP Education Software Package, LAN 50 Bus with Three (3) Years Software Support.** 1 **Base Package (50 Bus Capability).** • Equipment Evaluation • Cable Ampacity & Sizing - IEEE, ICEA, NEC • Wind Turbine Generator & PV array • HVDC Elements. 2 Load Flow/Voltage Drop. 3 Short circuit (ANSI/IEC) 4 Protective Device Coordination /Selectivity & Sequence of Operation (Star) 5 Optimal Power Flow (Economic Load Despatch) 6 Transient Stability Harmonic Analysis (Standard University License Bundle 5-Users perpetual license with Three years Software support)				01		

		Should be provided three days training			

11. Control System Lab :

S.No.	Item Name	Specification	Qty	Unit Price	Total amount Including Tax
1,3	(a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and wn natural undamped frequency. (b) Plot ramp response. To design 2nd order electrical network and study its transient response for step input and following cases. (a) Under damped system (b) Over damped System. (c) Critically damped system.	The process control simulator is a special purpose analog simulator with operational amplifiers The simulator permits a detailed analysis of the first order, second order and third order Systems and the application of proportional, integral and derivative control to the improvement of their performance. The simulator may be used at high speed for oscilloscope observation or at a low speed for meter observation. Frequency Response Analysis of PID controller & process can be studied for a wide range of frequencies (0.5Hz to 1KHz). **FEATURES** * Built-in Function generator (Sine & Square wave) * Self contained power supplies and power ON/OFF switch * Full mimic diagrams in the front panel **SPECIFICATIONS** **PROCESS** * Time constant of simple lags - 1ms, 0.47ms. * Time constant of Integrators - 1s. **CONTROLLER** * Proportional Band (p) - Corresponding to gain constants 0.5 to 25. **EXPERIMENTS** * Open loop responses of various process configuration. * Time domain study of a linear system. * Stability analysis of a linear process by gain variation method and check by using Root locus analysis. OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.	1		
2	To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse	1st order network trainer with different RC, RL Combinations with components of different values duly mounted on suitable box with cover Provided with waveform generator and scope in order to study waveforms using a single unit Scope Bandwidth : 50MHz Number OF Channel : 2Analog Channel Sampling RATE : 1GS/s all Channels Time Base Rang : 5ns/div to 50sec/div	1		

		Memory Depth b: 100kpts Acquisition Rate :≥50,000 per Second Input Impedance : 1 MΩ±2%/16pF±3 Pf VERTICAL Sensitivity : 500μV/div to 10 v/div Vertical Resolution : 8Bits Display :≥7inch FRA –Frequency Response for Bode plot Digital Voltmeter and Frequency Counter : Digital Voltmeter and 5- digit frequency counter upto scope bandwidth available Automatic Measurement : training signal : Different type of training signal available built in with lab guide , tutorials and content on Oscilloscope Fundamentals Function Generator : 20MHz function Generator with 20Vpp Square ,Pulse Ramp & 12Vpp sine wave with built in Wave gen to sweep from 20Hz up to 20Mhz FRA –Frequency Response for Bode plot Passive Probes : 2 Passive Probe provided Serial Decodes (Optional) : I2C and UART Option available for future upgradable (optional) PC Connectivity : USB Connectivity Warranty : Standard 3 year warranty NABL accredited calibration lab and service center in india and hard copy authorization certificate will be submit along with OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
4.	To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Leg Network (b) Lead Network. (c) Leg-lead Network.	The lead and a lag network is designed using passive components that makes implementation of compensation network. This unit has been designed to enable the students to go through the complete design procedure and finally verify the performance improvements by lag and lead compensation. Built-in variable frequency square wave and sine wave generators are provided for time domain and frequency domain testing of the system. * Adjustable amplifier gain facility. * Miniature connectors provided in the panel box with mimic diagram for easy study. * Connector provisions to connect external R&C values of	1		

		the network. * Built-in Sine & Square wave generators. Provided with waveform generator and scope in order to study waveforms using a single unit Scope Bandwidth : 50MHz Number OF Channel : 2Analog Channel Sampling RATE : 1GS/s all Channels Time Base Rang : 5ns/div to 50sec/div Memory Depth b: 100kpts Acquisition Rate :≥50,000 per Second Input Impedance : 1 MΩ±2% /16pF±3 Pf VERTICAL Sensitivity : 500µV/div to 10 v/div Vertical Resolution : 8Bits Display :≥7inch FRA –Frequency Response for Bode plot Digital Voltmeter and Frequency Counter : Digital Voltmeter and 5- digit frequency counter upto scope bandwidth available Automatic Measurement : training signal : Different type of training signal available built in with lab guide , tutorials and content on Oscilloscope Fundamentals Function Generator : 20MHz function Generator with 20Vpp Square ,Pulse Ramp & 12Vpp sine wave with built in Wave gen to sweep from 20Hz up to 20Mhz FRA –Frequency Response for Bode plot Passive Probes : 2 Passive Probe provided Serial Decodes (Optional) : I2C and UART Option available for future upgradable (optional) PC Connectivity : USB Connectivity Warranty : Standard 3 year warranty NABL accredited calibration lab and service center in india and hard copy OEM authorization certificate will be submit along with OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
5,6	Draw the bode plot in real time for a Non-	* Second order transfer function simulation. * Damping factor variation for 0.7 to 0.2.	1		

	Inverting amplifier. Draw the bode plot in real time for an Inverting amplifier.	* Time constant: 0.01s/0.1s * Implemented using Op-Amp. * In built power supply. * Housed in a sleek box. * On Board Signal Generation * Amplitude and Frequency Variation OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
7,8	Draw the bode plot for second order transfer function. Draw the bode plot for first order transfer function.	The process control simulator is a special purpose analog simulator with operational amplifiers The simulator permits a detailed analysis of the first order, second order and 3 order systems and the application of proportional, integral and derivative control to the improvement of their performance. The simulator may be used at high speed for oscilloscope observation or at a low speed for meter observation. Frequency Response Analysis of PID controller & process can be studied for a wide range of frequencies (0.5Hz to 1KHz) **FEATURES** * Built-in Function Generator (Sine & Square wave). * Self contained power supplies and power ON/OFF switch. * Simulated distance-velocity lag. * Full mimic diagrams in the front panel. * The simulated process # Simple Lag of 10ms, 2 lags of time constant 10ms that can be toggled to integrators of same time constant # Distance-velocity lag & delay 10ms * The simulated PID controller # Integral action control scaled in integral action time. # Derivative action control scaled in derivative action time. # Proportional band control scaled in % proportional band **SPECIFICATIONS** **PROCESS** * Time constant of simple lags - 10ms (fast) of 1ms(slow) * Time constant of Integrators - 10ms (fast) of 1ms(slow)	1		

		* Distance - velocity lag - 10ms **CONTROLLER** * Set Value Range - 0 to + 10V * Integral action Time range(Ti) - 250ms to 5 ms (fast); 25s to 0.5s (slow) * Derivative action Time range(Td) - 0-20ms (fast); 0-2 s (slow) * Proportional Band (p) - Corresponding to gain constants 0.5 to 25. * Display # 2 Nos of Analog meters (centre zero meters) provided to monitor the set value and measured value / deviation. **EXPERIMENTS** 1. Time domain study of a Linear system (process) & PID controller. 2. Frequency Response Analysis of a process & PID controller. 3. Open loop & closed loop response of 1st, 2 and 3 order process. (Type 0 and Type 1 ndrd system). 4. Open loop and closed loop responses of various process configurations. OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
.11	Design and calculate Kp, Ki for PI controller. Design PID controller and also calculate Kp, Ki, Kd for it.	The PID Control simulator is a special purpose analog simulator with operational amplifiers. The simulator permits a detailed analysis of the first order, second order and 3 order systems and the rd application of proportional, integral and derivative control to the improvement of their performance. The simulator may be used at high speed for oscilloscope observation or at a low speed for meter observation. **FEATURES** * Built-in Function Generator (Square wave) * Self contained power supplies and power ON/OFF switch * Full mimic diagrams in the front panel * The simulated process # Simple integrator of 10ms, 2 lags of the time constant	1		

		10ms * The simulated PID controller # Integral action control scaled in integral action time as per our requirement. # Derivative action control scaled in derivative action time as per our requirement. # Proportional band control scaled in % proportional band as per our requirement **SPECIFICATIONS** **PROCESS** * Time constant of simple lags - 10ms (fast) * Time constant of Integrators - 10ms (fast) * Set Value Range - (0-5) V **EXPERIMENTS** 1. Time domain study of a Linear system (process) & PID controller 2. Open loop & closed loop response of 1 , 2 and 3 order process. (Type 0 and Type 1 system) 3. P, PI, PID design and performance valuation in each cases. OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
12)	**Dynamic Control Modeling and Simulation Software** 1. Study analysis method using Root Locus 2. Study the effect of Close Loop Control on an Unstable System 3. Design and analyze Tow- Thomas biquad filter.	**Dynamic Control Modeling and Simulation Software** Require a software package to simulate the behavr of dynamic systems, such as electrical, mechanical and hydraulic systems or any combination of these. It should support graphical modeling, should allow to design and analyze dynamic systems in an intuitive way. The software should also offer facilities to convert control models into C codes to be executed in high end processors. Editor should support to enter models in a wide variety of systems including linear, non-linear, discrete-time, continuous-time and hybrid systems, without any restriction on a certain model representation. Model description can be given using equations, state space descriptions, bond graphs block diagrams, and components or iconic diagrams. These descriptions can be fully coupled to create mixed models. The software should have library separated in groups of domains having variety of ready to use drag and drop models. Some of the models required are listed below. • Various voltage and current sources; Inductors, resistors and capacitors; Diodes, op-amps and rectifiers; Motors and piezo actuators. • Orifices and laminar resistances; Cylinders, accumulators and tanks; Pumps, motors and valves; Flow, power and pressure sensors • Heat capacity and heat flow; Convection and radiation elements; Heat generators	01		

- Inertia's, springs and dampers; Bearings, backlash and clutch models; Belts, spindles, gears and differentials; AC/DC motors
- Linear and non-linear blocks; Sources &sinks; Filters and controllers; Transfer functions.
- All standard bond graph elements.
- Storage elements; Transformers and dissipators; Sources & sinks

Library models should be open and editable which can be modified as per requirement. Also it should have continuous and discrete time models.

- Scripting facility to use specialized scripting functions.
- Scripting functions provided like, open models, run simulations, change parameters, process the results and much more.
- Facility to run scripts from Octave and Matlab.
- Software should have inbuilt powerful simulation algorithms for solving ordinary differential equations (ODE) and differential algebraic equations (DAE).
- It should work on variety of numerical integration methods: fixed and variable step size, one-step, multi-step and multi-order methods.
- Simulation results can be shown in plots and animation windows. Plots should be fully configurable with Logarithmic views, true-type fonts, line styles, marker styles and backgrounds supported.
- It should automatically detect discrete-time loops in a model and assign each independent loop a separate sample rate.
- The Frequency Domain Toolbox should consist of the linear system editor, FFT analysis tools and model linearization functionality.
- The linear system editor for the design and analysis of linear systems.
- It should support continuous-time and discrete-time SISO systems using various representations.
- The graphical interface should allow editing a linear system in any desired form: ABCD state space, Transfer Function or Zero Pole Gain.
- Should generate Step response, Bode plot, Nyquist diagram, Nichols chart and Pole-Zero plots to quickly evaluate system behavior. Phase, gain and modulus margins should be calculated, as well as rise time, overshoot and steady state value.
- Facility to apply Fast Fourier Transforms (FFT) to any time-domain plot in simulator. Should have representations: Amplitude and Phase plot, Frequency plot and Power Spectral Density plot.
- Software should have facility to linearize any model to state space form and view characteristic properties like Eigen frequencies and damping.
- A set of powerful methods for time domain analysis should be available in software to perform during simulation.
- Parameter sweep for multiple simulations with a variation of parameter values.
- Parameter optimizationwith variation of model parameters with user defined cost functions to measure of model performance.
- Curve fittingto fit model performance to a given result by variation of parameters. Should help in optimization of model parameters when measurement data is

		available. • Sensitivity Analysis feature to investigate the effect of parameter variation on model performance. • Facility for Monte-Carlo Analysis and Variation Analysis. • Animation toolbox should offer support for conversion of simulation results as a movie. • Any variable of a model can be connected to 3 dimensional objects to show animated output. Standard objects like cubes, spheres, spirals, cones and cylinders can be manipulated using model variables or static values. These variables and values can also be used to set colors and sizes of objects and lights. • Bitmaps and CAD drawings can be imported in 3D Animations. • Should be able to generate animation result movies in various formats (Flash, AVI, WMV, etc.) • Control toolbox should aid in developing controllers for modeled machines, the Controller Design Editor, the Filter Editor and the Neural Network Editors. • The Controller Design Editor should offer facility to design feedback control systems, with editing as an ABCD State Space system, a Transfer Function or in a Zero Pole Gain form. • Changes in one of the subsystems should directly update all open plots and dialogs. For instance, adapting the controller gain immediately changes poles and zeros of the closed-loop system and the overall step response. • Facility to integratewith linear system exchange of MATLAB. • The Filter editor for designing of filters according to specifications. Should have ready to use filters like Bessel, Butterworth and ChebyChev filters, PID, lead/lag, or notch filters. • Neural Network Editorssupporting Adaptive B-Spline Networks and Multi-Layer Perceptron Networks. • B-Spline Editor for neural networks designing should be present. • Mechatronics Toolbox should includeMotion Profile Wizard, CAM Wizard and Servo Motor editor. • Servo Motor Editor should help to choose the proper servo motor for any electromechanical system design, like for example Brush DC (Iron Armature Motor, Hollow Rotor Motor, Disc Armature Motor), Brushless DC,AC synchronous, AC synchronous linear motors.			

12. Electrical Drive Lab:

S.No.	Item Name	Specification	Qty	Unit Price	TOTAL Including GST
1,2,6	Study and test the firing circuit of three phase half controlled bridge converter. Power quality analysis of 3 phase half controlled bridge converter with R and RL loads. Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.	*The SCRs mounted on suitable heat sinks and placed inside a nicely designed Cabinet *One number of 15 pin connector provided for Pulse output to external power module *Three Diodes each rated at 1200V @ 25A Each diode is provided with RC Snubber * One Number of toggle switch provided for Pulse Enable / Disable selection *The diodes are mounted on a suitable heat sinks * One number of LCD provided to indicate the firing angle value etc *Facilities are provided for switching ON/OFF, the AC supply to the converter Circuit with fuse and miniature circuit Breaker protection *Front panel provisions * Five Number of Touch Key Provided for Mode Selection *Required SCR and diode points are terminated at sockets for easy wiring by patch Chords for form half or full bridge converter and AC regulator *Various circuit configurations like half and fully controlled bridge can be wired byInterconnecting the devices using patch cords *Housed in a sleek cabinet *Pulse amplifier and isolator circuit, AC Synchronizing circuit is provided. * One number of Digital Controller based (dsPic) pulse controller for SCR Power circuit. * +5v 1Amp isolated dc supply provided for control circuits. * All are mounted in a nice powder coated cabinet with stickered front panel with mimic diagram indication * 230VAC input, One number of power On/Off switch with indication * 7Numbers of test points provided in the front panel for wave form * 1No of 100W/230V lamp with holder will be provided 3 phase auto transformer mounted on wheels for easy movement on lab input voltage 415 V out put voltage 470V , 8 Amp 1 HP DC Shunt Motor Armature voltage 220 V Field Voltage 180 V Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and chart mode. Provided with Speed Measurement Range: 0.5 to 19,999 RPM, Resolution: 0.1 RPM for < 1,000 RPM, 1 RPM for ≧1,000 RPM With various RPM adaptors	1		

		OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
3,4,7	Power Quality analysis of 3-phase full controlled bridge converter feeding R and RL load. Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads. Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.	*The SCRs mounted on suitable heat sinks and placed inside a nicely designed Cabinet *One number of 15 pin connector provided for Pulse output to external power module *Three Diodes each rated at 1200V @ 25A Each diode is provided with RC Snubber * One Number of toggle switch provided for Pulse Enable / Disable selection *The diodes are mounted on a suitable heat sinks * One number of LCD provided to indicate the firing angle value etc *Facilities are provided for switching ON/OFF, the AC supply to the converter Circuit with fuse and miniature circuit Breaker protection *Front panel provisions * Five Number of Touch Key Provided for Mode Selection *Required SCR and diode points are terminated at sockets for easy wiring by patch Chords for form half or full bridge converter and AC regulator *Various circuit configurations like half and fully controlled bridge can be wired byInterconnecting the devices using patch cords *Housed in a sleek cabinet *Pulse amplifier and isolator circuit, AC Synchronizing circuit is provided. * One number of Digital Controller based (dsPic) pulse controller for SCR Power circuit. * +5v 1Amp isolated dc supply provided for control circuits. * All are mounted in a nice powder coated cabinet with stickered front panel with mimic diagram indication * 230VAC input, One number of power On/Off switch with indication * 7Numbers of test points provided in the front panel for wave form * 1No of 100W/230V lamp with holder will be provided 3 phase auto transformer mounted on wheels for easy movement on lab input voltage 415 V out put voltage 470V , 8 Amp 1 HP DC Shunt Motor Armature voltage 220 V Field Voltage 180 V Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and chart mode. Provided with Speed Measurement Range: 0.5 to 19,999 RPM, Resolution: 0.1 RPM for < 1,000 RPM, 1 RPM for	1		

		≧1,000 RPM With various RPM adaptors OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
5,8	Experimental analysis of 3-phase AC voltage regulator with delta connected, star connected (with floating load), R& RL load Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.	*The SCRs mounted on suitable heat sinks and placed inside a nicely designed Cabinet *One number of 15 pin connector provided for Pulse output to external power module *Three Diodes each rated at 1200V @ 25A Each diode is provided with RC Snubber * One Number of toggle switch provided for Pulse Enable / Disable selection *The diodes are mounted on a suitable heat sinks * One number of LCD provided to indicate the firing angle value etc *Facilities are provided for switching ON/OFF, the AC supply to the converter Circuit with fuse and miniature circuit Breaker protection *Front panel provisions * Five Number of Touch Key Provided for Mode Selection *Required SCR and diode points are terminated at sockets for easy wiring by patch Chords for form half or full bridge converter and AC regulator *Various circuit configurations like half and fully controlled bridge can be wired byInterconnecting the devices using patch cords *Housed in a sleek cabinet *Pulse amplifier and isolator circuit, AC Synchronizing circuit is provided. * One number of Digital Controller based (dsPic) pulse controller for SCR Power circuit. * +5v 1Amp isolated dc supply provided for control circuits. * All are mounted in a nice powder coated cabinet with stickered front panel with mimic diagram indication * 230VAC input, One number of power On/Off switch with indication * 7Numbers of test points provided in the front panel for wave form * 1No of 100W/230V lamp with holder will be provided 3 phase auto transformer mounted on wheels for easy movement on lab input voltage 415 V out put voltage 470V , 8 Amp 1 HP 3 Ph Sq. Cage Induction Motor voltage 415 V RPM 1440-1480 Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and	1		

		chart mode. Provided with Speed Measurement Range: 0.5 to 19,999 RPM, Resolution: 0.1 RPM for < 1,000 RPM, 1 RPM for ≧1,000 RPM With various RPM adaptors OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
9	Control speed of a 3-phase BLDC motor.	* One number of (dsPIC) micro controller based pulse generator. * Controller dsPIC 4011 based 16 bit operation of PWM generation * One number of LCD provided to indicate speed, duty cycle and mode of operation * Test points are provided to view the test signals using CRO. * One number of Hall effect current sensor provided to trace the DC link current. * +5v/1Amp isolated dc supply provided for control circuits. * Circuit is provided with BLDC motor Open loop and closed loop speed control programs. Open / closed loop function can be done by different selection in case of motor load or simple lamp can be used as load * SPM Package type IGBT (with internal driver) fitted with suitable heat sink used for inverter power circuit * High speed opto-coupler provided to isolate PWM Pulse. * Over current protection provided with reset option. * Five Number of Touch Key Provided for Mode Selection. * One number of serial port connector provided to download students own code. * **Input** Voltage 230V-1Φ AC ;**Output** 0 -150 V (Phase to Phase)@2A * Feedback proximity sensor input (Optional) **Interface Card : for proper feedback from motor Hall Effect sensor feedback provided to the inverter control circuit** **1HP BLDC MOTOR – SPRING BALANCE LOAD SETUP** Rated Power - 940W Phase - 3φ Input Rated Voltage - 310 VDC Rated current - 4A Rated Torque - 3Nm Rated Speed - 3000 RPM No. of poles - 8 Poles Position Sensor - Hall effect A, B, & C Back EMF - Trapezoidal EMF	1		

		OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
10	Control speed of a 3-phase PMSM motor using frequency and voltage control	* One number of (dsPIC) micro controller based pulse generator. * Controller dsPIC 4011 based 16 bit operation of PWM generation * One number of LCD provided to indicate speed, duty cycle and mode of operation * Test points are provided to view the test signals using CRO. * One number of Hall effect current sensor provided to trace the DC link current. * +5v/1Amp isolated dc supply provided for control circuits. * Circuit is provided with PMSM motor Open loop and closed loop speed control programs. Open / closed loop function can be done by different selection in case of motor load or simple lamp can be used as load * SPM Package type IGBT (with internal driver) fitted with suitable heat sink used for inverter power circuit * High speed opto-coupler provided to isolate PWM Pulse. * Over current protection provided with reset option. * Five Number of Touch Key Provided for Mode Selection. * One number of serial port connector provided to download students own code. * **Input** Voltage 230V-1Φ AC ;**Output** 0 -150 V (Phase to Phase)@2A * Feedback proximity sensor input (Optional) **Interface Card : for proper feedback from motor Hall Effect sensor feedback provided to the inverter control circuit** **1HP PMSM MOTOR – SPRING BALANCE LOAD SET UP** Speed - 2000rpm Rated Voltage - 220 VAC Rated current - 3.3 A Rated Torque - 2.39 N-M Power - 1 HP Position Feedback - (Encoder 1500 PPR & 3Nos.of hall Sensors placed with 120 Electrical degrees apart Rotor pole - 6 Poles Phase - 3φ Back EMF - Sinusoidal OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.	1		
11.	Control speed of universal motor using	*Four thrusters and two diodes are provided *SCR rating : 1200Volt @ 25 Amp *The device are mounted on suitable heat sinks and placed	1		

	AC voltage regulator.	inside a nicely designed Cabinet *Snubber circuit is provided to each devices *All SCR and Diode points are terminated at sockets for easy wiring by patch cords *Various circuit configurations like half and fully controlled bridge can be wired by interconnecting the devices using patch cords. * One number of Digital Controller based (dsPic) pulse controller for SCR Power circuit. * Five Number of Touch Key Provided for Mode Selection * One number of LCD provided to indicate the firing angle value etc * One Number of toggle switch provided for Pulse Enable / Disable selection * +5v 1Amp isolated dc supply provided for control circuits. * All are mounted in a nice powder coated cabinet with stickered front panel with mimic diagram indication * Facilities are provided for switching ON/OFF, the AC supply to the converter circuit With fuse and miniature circuit Breaker protection * 230VAC input, One number of power On/Off switch with indication * One number of 15 pin connector provided for Pulse output to external power module * 7Numbers of test points provided in the front panel for wave form * 1No of 100W/230V lamp with holder will be provided **FHP Universal MOTOR** Speed - 2600rpm Rated Voltage - 220 VAC Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and chart mode. Provided with Speed Measurement Range: 0.5 to 19,999 RPM, Resolution: 0.1 RPM for < 1,000 RPM, 1 RPM for ≧1,000 RPM With various RPM adaptors OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
12,13	Study 3-phase dual converter. Study speed control of dc motor using 3-phase dual converter.	This module provides gate pulses for three phase Dual converter power circuit under circulating and non circulation current mode of operation. One number of Digital controller is provided for gate pulse generation.	1		

Six gate signals for negative group SCR converter.

Six gate signals for positive group SCR converter.

Five number of touch keys provided for PWM mode selection and firing angle variation .

One number of LCD provided to indicate Firing angle variation, set & actual speed and mode of operation of dual converter.

Two number of toggle switch is provided for Enabling the gate pulses.

+5V,1Amp isolated DC supply provided for control circuits.

Two number of 15pin D connector provided for PWM output to external module.

One number of 9pin connector is provided for speed sensor interface.

Two number of Toggle switches provided for Enabling and Disabling the gate pulses.

Test points are provided on the front panel for detailed study of circuit signals by the student.

One ON/OFF switch with indicator provided to power the control circuitry.

Input 230V ±10%, 50Hz single phase AC

+5V,1Amp isolated DC supply provided for control circuits.

* Two set of Six SCRs each rated at 1200V@ 25A, each SCR is provided with RC Snubber circuit. One set for positive group and another set for negative group SCR converter.

* All 'G', 'K' terminals are terminated in front panel for student patching.

* 25 pin shielded cable for pulse input.

* One center tapped inductor (0%, 50%,100%) for power circuit with circulating current mode operation (optional)

* All components are housed in a fine screen printed cabinet

* Two number of 150VA Three phase Transformer Provided for power circuit input. Input : 0-230V AC per Phase

Output: 0-24V AC @ 2amp per Phase

* The SCRs mounted on suitable heat sinks and placed inside a cabinet

* Facilities are provided for switching ON/OFF, the AC supply to the converter circuit with fuse and miniature circuit Breaker protection for each group of converter circuit.

* Test points are provided to view the gate pulses before and the pulse isolation section and individual gate pulses can be viewed for each SCR's.

* Test points are provided for the three phase reference signals.

* Two number of 15pin connectors are provided for pulse input from the controller.

* Required SCR points are terminated at sockets for easy

		wiring by patch chords for Three phase Dual converter circuit. * Circuit configurations like circulating and non-circulating current mode operation of Dual converter can be performed. * One number of field supply box is provided for the DC motor field excitation (optional). **iii. 100W separately excited DC shunt motor :** * Armature voltage : 0-48V DC, 3 Amp * Field voltage : 0-48V DC * Shunt type separately excited * Speed : 1500 rpm * Rating : 100W * One Proximity sensor provided to sense the speed * Double side shot extension with speed indication * Mechanical loading arrangement OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
14.	Study three-phase cyclo-converter	This trainer is designed to drive a 3Φ, motor, by implementing V/F controller on a 3Φ-3Φ Cyclo-converter, using SCR circuits. * This module is designed for three phase half wave-step down cycloconverter. It consists of 18 Synchronized firing pulses generated by a powerful FPGA, 18 SCRs, Relevant power supply and power circuitry for frequency divisions. Control Circuit : * Built-in FPGA Controller based pulse generation. * With display and Keypad. * Able to perform independent V & F control and V/F control of 0.5HP AC Induction Motor. (under slow speed corresponds to 15Hz O/P Frequency) Power Circuit : 18 nos. SCR with RC snubber protection is provided for 3phase cycloconverter power circuit (each phase consist of 6 SCRs) Rated at 1200V@25 Amps. * 3 nos. center tapped inductor (0%.50%, 100%) is provided for power circuit. * 18 nos. isolated gate pulses for SCR power circuit. * MCB protection. * Housed in a power coated & stickered cabinet. * Provision for V/F control Power Supply * Input 110V ± 10%, 50Hz three phase AC supply. * ± 15V DC, 9V, 9V,9V AC(3phase) for the firing circuits. * 230V, 3Φ Step down Isolation transformer provided for	1		

		SCR Power Circuit. Output Ranges * Frequency Variation : 1Hz to 1/3rd of supply frequency (Approx : 1Hz to 16Hz) * Voltage Variation : 0 to 90% of supply voltage. OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			
15	Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter.	* Six Numbers of High speed Opto - isolator provided for PWM isolation * One Number of IGBT -SPM FSBB20CH60-with suitable snubber circuit & Heat sink Provided for power circuit * Rating of device is 600V@20AMP * Isolated provided for control IC's * One number of Single phase diode rectifier (600v 25A) with filter capacitor provided For input ac rectification. For power circuit input with fuse protection * One number of Analog voltmeter provided for dc rail voltage measurement. * Four Number of Hall Effect current sensor provided for output current & dc current Measurement & protection * Four number of op-amp signal conditioner circuit provided for all current sensors & Output terminated in front panel for current wave measurement. * Over current Trip circuit provided for Over Load protection. * One number of Led provided to indicate TRIP Status * One number of Reset Switch provided to reset the Trip Function * Six Numbers of banana connector termination provided in power circuit Input & External load interface * One numbers of 15 pin connector provided for PWM Interface from external controller * 10 Numbers of test points provided in control section for wave form measurement in CRO * All are mounted in attractive powder coated cabinet with sticker front panel mimic Diagram indication. * 230v ac input, one number of power on / off switch with indication.	1		

		Power circuit input : 230V AC / 300V DC @ 4Amp PWM input : 6 Numbers of PWM – 5VDC level Protection : Current setting based on the load. * One number of Digital Controller (dsPic30f4011) provided for PWM Generation. * Five Number of Touch Key Provided for PWM Mode Selection * One number of LCD provided to indicate Motor set speed, actual speed, chopper mode etc * One Number of toggle switch provided for PWM Enable / Disable selection * +5V 1Amp isolated dc supply provided for control circuits. * All are mounted in a nice powder coated cabinet with stickered front panel mimic diagram indication * 230VAC input, one number of power On/Off switch with indication * One number of 15 pin connector provided for PWM output to external power module * One number of 9 pin connector provided for Speed sensor Interface * 7 Numbers of test points provided in the front panel for waveform measurements. 1 HP 3 Ph Sq. Cage Induction Motor voltage 415 V RPM 1440-1480 With RPM Feedback facility and mechanical loading arrangement Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and chart mode. OEM authorization should be compulsorily attached with the technical bid.OEM Should have R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology.			

13. Power System Protection Lab :

S. No.	Item Name	Specification	QTY	Unit Price	TOTAL PRICE including GST
1	To determine fault type, fault impedance and fault location during single line to ground fault. To determine fault type, fault impedance and fault location during single line-to line fault. To determine fault type, fault impedance and fault location during double line to ground fault.	* 3 phase power supply, simulating the 3 phase generation * To simulate 3 phase Balanced system Fault and unsymmetrical faults * Fault study with single line and double line in 3 phase system * Faults : # L-G -Fault # L-L- Fault # L-L-G-Fault # Single Conductor open fault # Double Conductor open fault # Fault through impedance * Theoretical calculations an verification with practical results. * The transmission lines are simulated by high frequency Inductance & resistance for short, medium at long line. Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 counts, Multi device Connection and chart mode. Input supply: 0-415 V AC ±10% 50 HZ. Three phase Auto transformer: rating 1KVA, having suitable no. of digital volt meters and ammeters or other displays on the panel for measuring requisite values of voltages and currents provided on modular Extruded Aluminum Profile panel Resistive loads for current limiting while faults. Other requirements: Adequate number of patch cords, connecting leads, Good quality, reliable terminals, sockets required at appropriate places on panel for connections, Strongly supported by lab manual and diagrammatic representation, detailed operating instructions OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III	1		

		Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
2	To study the operation of micro-controller based over current relay in DMT type and IDMT type.	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. **The trainer should have following specifications :** **Numerical over current relay** IDMT/DEFINITE TIME/INSTANTANEOUS LOW - SET/HIGH-SET NON-DIRECTIONAL NUMERICAL/MICROPROCESSOR BASED OVER CURRENT RELAY (OCR) WITH EARTH FAULT RELAY ACCURACY OF OPERATING TIME FOR IDMT¬ ±5% DEFINITE TIME¬ ±3% INSTANTANEOUS¬ Less than 2 Cycles RELAY RATED CURRENT (IN) 1A or 5A user selectable. FREQUENCY 50Hz or 60Hz. AUXILIARY VOLTAGE RANGE 85V - 275V AC/DC, 21 -130V DC PICK-UP 103% DROP-OFF 97% AC BURDEN < 0.4VA for 5A < 0.2VA for 1A @ unity pf. DC BURDEN < 5W during non operatedcondion< 7W during operated condion CONTACT RATING AC: 250 V @ 30 AMP DC: 24 V @ 30 AMPS, 2 C/O or 3 C/O	1		

Low Set PS

Phase Low -Set PS

Setting Range (0.1 - 2.5) In - 5A (0.5-2.5) In-1A

Step 0.01

TMS Range (0.10-1.60)

TMS Step 0.01

Earth Low -Set PS

Setting Range (0.1-0.8) In

Step 0.01

TMS Range (0.10-1.60)

TMS Step 0.01

Current Injunction Source

* One number of auto transformer provided for current adjustment

* One number of loading transformer used for current source

* Current output applied to CT.

* Auxilliary tripping circuit and its connections to be done by student only

* System should also capable to make students under stand connections of relay in power system using patch chords.

* One number of digital ammeter used to indicate current

* Specification: current range: 0-20Amp AC. (continuously variable)

* One number of automatic relay tripping time measurement circuit

* One number of start/stop push-to on switch provided for time measurement circuit

* One number of digital timer provided to measure relay tripping time

* One number of reset switch provided for timer reset

One number of NO contacts @ 220V ,10Amp rating

One number of NC contacts @ 220V ,10Amp rating

OEM authorization should be compulsorily attached with the technical bid.
OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar

		Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
3	To analyse the operation of micro-controller based directional over current relay in DMT type and IDMT type.	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. CT Input 2A, Function IDMT/DMT Curve IDMT/DMT curve, Features Self powered / supply 48vdc or 230V AC, One number of variable AC current Source of 0-20A, One number of Autotransformer is provided to adjust the current output continuously One number of loading & phase shifting transformer provided for current and phase angle adjustment Mimic explanation of system by making two generators so the direction of current can be reversed., One number of digital AC Ammeter (0-30A) /3.5 digit / VERITEK Make is provided to measure the current input in amp, * Auxilliary tripping circuit and its connections to be done by student only * One number of ZCD for phase angle measurement * One number of 12v auxiliary relay used for contractor operation * Current input : 0-20 Amp * Voltage input : 0-230 V * Phase diff : 0-89 degree * System should also capable to make students under stand connections of relay in power system using patch chords. * One number of digital ammeter used to indicate current One number of Automatic trip time measurement circuit	1		

		(ATTM Circuit) is provided, One number START push button is provided in ATTM Circuit, One number STOP push button is provided in ATTM Circuit, One number Digital stop Clock is provided in ATTM Circuit to measure relay trip time in S , S/10 , S/100, One number reset switch is provided in front panel to restart the digital stop clock All are mounted on a nice cabinet with diagram stickered on front panel.& 230VAC@50Hz AC Input with power ON/OFF Switch OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
4	To study the micro-controller based under voltage relay.	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. **The trainer should have following specifications :** • Should be supplied with the instrument which can log the value of the Fault Voltage v/s Tripping Time in to the Computer via a universal serial bus/MODBUS/RTU communication. Features Protection • 2 stage under/over voltage (27/59) • Numerical, true RMS measurement	1		

		• Wide voltage setting ranges • Multiple inverse characteristics (160) Control • The relay has 8 output contacts • Trip/alarm for both elements 2 N/O • Common starter for both elements 1 N/O • Element 1operated 1 N/O • Element 2 operated 1 N/O • Protection Unhealthy 1 N/C • Timer 1 N/O • Trip circuit fail 1 N/O • Timer for capacitor bank to switch to safer value before successive switching of the breaker Monitoring • Trip circuit supervison • Self-monitoring facility User Interface • Seven segment LED display • LED indications • Sealable front cover to prevent unauthorised access Other Features • Drawout modular case • Compact design • Non-volatile memory for trip indication Voltage Input Rating upto 230V A.C (same terminals) Frequency (Fn) 50 Hz Nominal Auxiliary Supply Nominal Voltage Voltage Range 24/30/48/110V DC 18-135VDC 48/110/220V DC 43-280VDC (or) 110V AC DC Input Nominal Voltage Voltage Range 24/30V DC 18 - 36V DC For higher status input voltages external dropping resistors will be supplied. Settings Element 1 : UV, OV or OFF			

		Element 2 : UV, OV or OFF Voltage Setting 5V to 275 V in steps of 1 V **Voltage Injection Source** * One number of auto transformer used for Voltage adjustment * Voltage output terminated in the banana-sockets * One number of digital meter used to indicate output voltage * Specification : Voltage range: 0-300V AC. (Continuously variables) Set Voltage , Nominal safe voltage and fault voltage can be configured Safe voltage provided initially and test voltage is applied when push button switch is pressed * One number of 12v auxiliary relay used for contractor operation * System should also capable to make students under stand connections of relay in power system using patch chords. * One number of digital ammeter used to indicate current One number of Automatic trip time measurement circuit (ATTM Circuit) is provided, One number START push button is provided in ATTM Circuit, One number STOP push button is provided in ATTM Circuit, One number Digital stop Clock is provided in ATTM Circuit to measure relay trip time in S , S/10 , S/100, One number reset switch is provided in front panel to restart the digital stop clock All are mounted on a nice cabinet with diagram stickered on front panel.& 230VAC@50Hz AC Input with power ON/OFF Switch OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work			

		completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
5	To study the micro-controller based over voltage relay.	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. **The trainer should have following specifications :** • Should be supplied with the instrument which can log the value of the Fault Voltage v/s Tripping Time in to the Computer via a universal serial bus/MODBUS/RTU communication. Features Protection • 2 stage under/over voltage (27/59) • Numerical, true RMS measurement • Wide voltage setting ranges • Multiple inverse characteristics (160) Control • The relay has 8 output contacts • Trip/alarm for both elements 2 N/O • Common starter for both elements 1 N/O • Element 1operated 1 N/O • Element 2 operated 1 N/O • Protection Unhealthy 1 N/C • Timer 1 N/O • Trip circuit fail 1 N/O • Timer for capacitor bank to switch to safer value before successive switching of the breaker Monitoring • Trip circuit supervison • Self-monitoring facility User Interface • Seven segment LED display • LED indications	1		

• Sealable front cover to prevent unauthorised access

Other Features

• Drawout modular case

• Compact design

• Non-volatile memory for trip indication

Voltage Input Rating upto 230V A.C (same terminals)

Frequency (Fn) 50 Hz Nominal

Auxiliary Supply

Nominal Voltage Voltage Range

24/30/48/110V DC 18-135VDC

48/110/220V DC 43-280VDC

(or) 110V AC

DC Input

Nominal Voltage Voltage Range

24/30V DC 18 - 36V DC

For higher status input voltages external dropping resistors will be supplied.

Settings

Element 1 : UV, OV or OFF

Element 2 : UV, OV or OFF

Voltage Setting

5V to 275 V in steps of 1 V

Voltage Injection Source

* One number of auto transformer used for Voltage adjustment

* Voltage output terminated in the banana-sockets

* One number of digital meter used to indicate output voltage

* Specification : Voltage range: 0-270V AC. (Continuously variables)

Set Voltage , Nominal safe voltage and fault voltage can be configured

Safe voltage provided initially and test voltage is applied when push button switch is pressed

* One number of 12v auxiliary relay used for contractor operation

* System should also capable to make students under stand connections of relay in power system using patch chords.

* One number of digital ammeter used to indicate current

One number of Automatic trip time measurement circuit

		(ATTM Circuit) is provided, One number START push button is provided in ATTM Circuit, One number STOP push button is provided in ATTM Circuit, One number Digital stop Clock is provided in ATTM Circuit to measure relay trip time in S , S/10 , S/100, One number reset switch is provided in front panel to restart the digital stop clock All are mounted on a nice cabinet with diagram stickered on front panel.& 230VAC@50Hz AC Input with power ON/OFF Switch OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
6	To study the operation of micro-controller based un-biased single-phase differential relay. To study the operation of micro-controller based biased single-phase differential relay.	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. This set up is designed to study the various protection schemes of three phase transformer. 1. Single Phase Transformer. 2. Control Panel 3. Current Limiting Resistor One no of Single phase numerical transformer protection relay	1		

		□ DSP Based Digital Algorithms □ Minimum Trip Time - 30ms □ Password protected □ 20x4 LCD Display □ Power system frequency 50Hz □ Field Configurable CT Secondary 1A or 5A □ Configurable Dual Slope Characteristic □ Transformer Differential Protection (ANSI CODE : 87) □ 2 number of output contacts □ History of last 20 Events □ Disturbance Record of last 10 Events □ Configurable Pre and Post Fault Cycles □ Draw-out facility with inbuilt CT shorting Display of Ip, Is, Ib and Trip current with event time logging. 1. SINGLE PHASE TRANSFORMER One Number of Single phase , 200VA, 230 / 48V Stepdown transformer , One Number of Single phase , 200VA, 24-0-24/ 24-0-24 Open type transformer provided. 2. CONTROL PANEL * Digital volt and ampere meters for primary and sec. sides * Fault Resistances. Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto $3\frac{5}{6}$ Digits, Multi device Connection and chart mode. RANGE OF EXPERIMENTS. Biased percentage differential relay operation OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			
7	To study the operation of micro-controller un-based biased three phase	Salient Features The trainer consist of set of associated relay testing sub sets mounted in a light weight sturdy aluminum profile flat	1		

	differential relay. To study the operation of micro-controller based biased three phase differential relay.	demo panel system . do not need any separate testing kit Facilitate easy and safe wiring using 4mm sturdy shrouded banana patch chords Have sturdy enclosure with colorful overlays showing circuit diagrams and its connections for easy understanding of students. Set of instruction working manual. This set up is designed to study the various protection schemes of three phase transformer. 1. Three Phase Transformer. 2. Control Panel 3. Resistive Load 1. THREE PHASE TRANSFORMER One Number of Three phase , 3KVA, 415 / 415, Open type star star transformer provided. 2. CONTROL PANEL * Aluminum Profile panel * One number of DSP based 3 Phase Power analyzer 3 Ph. Power Analyzer provided. It will show all the Electrical Parameters Eg.: Voltage, current, KW, KVA, KVAR, PF ,Hz, etc.,. * Provided with data logging device with Bluetooth facility suitable for Android and iOS platforms, True RMS with accuracy upto 6000 Counts , Multi device Connection and chart mode. * One number of Time totalizer. * 3 Phase Input MCB Contactors and Indicators * Fault Simulating Switches * Push Buttons for system start stop. * Relay Trip Status Indicator. * Digtal volt and ampere meters for primary and sec. sides * Three Phase Resistive Load and Fault Resistances. One no of three phase numerical transformer protection relay – Multi functional % differential relay · – Programmable Starting Current & Dual Bias Characteristics · – Biased current Differential Protection. · – Dual Slope characteristics.			

		· – Instantaneous Differential Hiset. · – Adjustable 2nd harmonic restraint. · – Adjustable 5th harmonic restraint. · – Inbuilt CT Ratio correction factor. · – Inbuilt Vector group compensation hence no need of interposing Ct's. · – Two groups of settings. · – History of 5 latest faults. Settings Diff. Pickup (ik) : 0.10 to 1.00pu in 0.05pu steps. Slope1 (DF1) : 10 to 100% in 5% steps. Slope2 (DF2) : 50 to 200% in 5% steps. Breakpoint (kp) : 1.0 to 10.0pu in 0.1pu steps. Diff. Hiset : 2 to 20pu in 1pu steps. CT Ratio W1 : 0.5 to 2.00pu in 0.01pu steps. CT Ratio W2 : 0.5 to 2.00pu in 0.01pu steps. Inrush (2f) : 10 to 50% in 5% steps. Over excitation(5f) : 10 to 100% in 5% steps. Vector Groups : Yy0, Yy6 Dd0, Dd2, Dd4, Dd6, Dd8, Dd10 , Dy1, Dy5, Dy7, Dy11 Yd1,Yd5, Yd7, Yd11 Ratings Current (In) : 1A or 5A or 0.577A Frequency : 50Hz OEM authorization should be compulsorily attached with the technical bid. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BIS standards and within the specified tolerance limits.The OEM/Bidder must have at least 3 years' experience of successful execution of contracts of similar Items/Machines nature to Central / State Govt. Departments / Technical Institutions / TEQIP-III Institutions. Relevant Proofs (Order Copies) must be attached with the Bid. The bidder should have at least two orders minimum of Rs. 10 lakhs or a single order of Rs. 15 lakhs for same Related Items. The bidder should furnish the information supported by purchase order or work completion certificates from the concerned department/ institution.OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan,			

14. Drilling Fluids & Cementing Lab :

S. NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**Mud balance (Mud Weight & Mud density)**	**Mud balance, 4 scale, plastic** Ro read beam graduated into four scales Pouixls per galleon Specific gravity Pounds per cubic foot Pounds per square inch per 1,000 feet of depth Size of equipment = 21,5'' x 5'' x4.5'' Weight of equipment = 3 lb (1.4 kg) Mud Cup Capacity = 200cc Density Measuring Range 8-24 lb/gal = 54-180 lb/ft^3 =0.72 -2.88 specific gravity gm/cm^3 =310-1250 lb/sq inch/100ft of depth **Must contain** : Mud Balance with Case **ACCESSORIES** : Single baled mixer ham bench with container 230VAC	01		
2.	**Marsh Funnel (Plastic viscosity or marsh funnel viscosity.)**	Marsh Funnel- A Conical-sapped funnel with Funnel top diameter =6 inch Total length of funnel= 14 inch Fitted with a small-bore copper tube frilled 3/16 inch on the bottom end with nozzle length = 2 inch A screen over the top=1/8 inch mesh screen The capacity of funnel is = 1500 cc. **It is up of thermo resistant material.**	01		
3.	**Visco-gel multi speed viscometer (Gel strength)**	Six speed viscometer with test speed of 3, 6,100,200,300,600 rpm are available via synchronous motor driving through precision gearing. Any test speed can be selected without stopping rotation. Motor= 60 Hz and 115 volts Dimension of equipment= 15.2x6x10.5 inches Weight of equipment= 15 lbs The shear is stress is displayed continuously on the calibrated scale, so that time-dependent viscosity characteristics can be observed as a	01		
4.	**Filter press hydraulic dead weight assembly (filtration loss)**	Working pressure-100 psig Filtering area-7.1 inch as specified by API Series-300 LPLT filter press Cell body, top cap, base cap & tube made of stainless steel Gasket, rubber Screen – 60 mesh **ACCESSORIES:** Filter cake ruler Graduated cylinder-25 ml.	01		
5.	**Sand content kit (Sand content)**	200 mesh sand screen A sieve mounted in a a plastic cylinder 2^{1x4} inch in dia x 3^{3*8} inch long Size-33x15x15 cm measuring tube –scale-0 to 20% plastic funnel weight of Funnel-0.7 kg	01		

15. Reservoir Engineering Lab :

S NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	GAS PARAMETER (PERMEABILITY)	1. Pressure gauge-0.00 to 1.00 ATM 2. Golden Core holder to hold different sizes core ½" to ½" through rubber ring. 3. Digital Temperature indicator attached with core holder 4. A Flow meter (Rota meter) of capacity 0 to 100 cc/sec with regulator holding OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer	01		
2.	LIQUID PARAMETER (PERMEABILITY)	1. Pressure gauge-0.00 to 1.00 ATM 2. Golden Core holder toehold different sizes core ½" to 1" through Neoprin rubber bush. 3. Digital Temperature indicator attached with core holder 4. A burette 5 cc , 10 cc, 50 cc capacity holding arrangement. 5. Regulator to operate different pressure through a gas pressure line attached with pressure gauge. 6. Two different type of value to create water pressure & air pressure to Core. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer	01		
3.	POROSITY HELIUM BY POROSIMETER (POROSITY)	1. Core diameter- 1 to 1.5 inch 2. Core length – up to 3 inch 3. Porosity range- up to 60% 4. Charge pressure in reference volume = 200 psi 5. Pressure sensor accuracy = 0.1% 6. Electrical requirements-110-120 volt AC, 50 or 60 Hz 7. N2/ helium requirements = 500 psi OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	01		
4.	POROSITY BY SATURATION METHOD (POROSITY)	The arrangement has a vacuum pump with attachment of conical flask & separating funnel and a double stage high vacuum pump. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO &CE certified Manufacturer	01		
5.	BHP CHART READING WITH MICROSCOPE	It is characterized by carefully lapped micro meter Screws and nuts provided with compensating spring Deice to eliminate back-lash and to minimize its development after prolonged use. The linear carriage , carried on a rugged and agent cast Frame is provided with Micrometric motion through	01		

		Its entire 20cms. Range, read to 0.0001 cm directly other Micrometric head. Micrometric heads are made of gun metal. A compensating spring device minimizes development of back-lash after constant use over along period. The machined opposing surfaces of the carriage and the frame and inter ground to give an oil smooth movement free from any lateral shift. The cross carriage is carried on the liner slide and has a range of 10cms. Read directly to 0.0001 cm on the micrometer head. The lifetime stainless scales are precision machine divide on the latest machines to give maximum accuracy. Micrometer drum heads are of large dia divided to read directly to 0.0001 cm. the microscope tube is provided with rack and pinion focusing and is felted with finest achromatic optics. The instrument is supplied with 3" objective and 10x. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer			
6.	**CORE PLUGGING MACHINE WITH POLISHING MACHINE**	The machine plugging the hard rock's like granlte, Basalt, sand stone, lime stone shale and refractory etc. Core sizes ½",1" & 1.5" OD. Thread sizes ½ BS-14 TPI. Cutting depth of 155 to 160 mm. The machine be equipped with core drill bit of ½", 1' OD and 1.5" OD. The machine be equipped with tray having suitable vice to hold core samples to be drilled the drill will be operate in coolant tank in wet condition water be passed through water adopter. The units have a sturdy base with pillar support along with rack/pinion for adjustment. The electric motor of the machine for working on 1 HP, 3 phases, 415/440 V. A/c, 50/60 Hz. With two step pulley and belt drive. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Centerin the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer	**01**		
7.	**CUTTING /CHIPPING MACHINE**	The machine be designed for Rock/Core Cutting / Chipping machine for preparation of hard rock for preparation of thin sections like sandstone, limestone granite, basalt etc. 1. The machine accommodate a metal disc with fine mm thickness for chipping size diamond sticking for 8" dia, 1.5 mm thickness for chipping size 1" to 3". 2. The machine operated by AC motor (Kirloskar make) 1 HP with AC Drive for variable speed of 1 to 1400 RPM shown through a Digital RPM meter. The hard rocks, limestone and shale etc using for chipping. 3. The machine body made of stainless steel – SS-304, 1.5 mm (minimum) thickness water inlet & outlet arrangement with pipe line to creating water pressure as a cooler in place of sample cutting. 4. Sample holding arrangement & to move forward attachment in the sample holder. 5. The cutting disc cover attached in the upper side of the disc.	**01**		

		6. Provision for cleaning of lower reservoir. 7. The upper side covered by a transparent Perspex/Acrylic sheet. 8. The supply currant AC, 440V, 50 Hz. 9. The control unit designed with on/off circuit breaker switch, variable speed regulator & fuse based for protection any electrical fault. 10. Extra 2 nos diamond metal disc. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer			
8.	**RESISTIVITY MEASUREMENT SETUP**	The complete setup made of imported Perspex sheet, rectangular box, and height six inches. Sliding Bar with three nos probe, using brine solution oil. Variac, CVT, Analog & Digital Meter, Range 0-200mA OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer	**01**		
9.	**CORE FLOODING APPARATUS**	**1)** Stainless Steel (Grade-304) Core Holder to hold core diameters of 1 ½ " and a length upto6 inches with 1" thickness to stand 5,000psi pressure. Core holder to be leak proof with (a) internal pressure of 3,000 psi and b) overburden pressure of 4,500 psi. **2)** Silicon sleeves of 3" diameter with SS braded to hold pressure of 5,000 psi to be accommodate in core in core holder with six nos. sleeves for each diameter of 1 ½" core. **3)** A back pressure regulator to regulate maximum 3,000 psi pressure to be coupled to the core holder as per drawing. Fluid flow rate 0.1 to 10 ml/min. **4)** SS connecting tubes of diameter 1/8 " and minimum length of 1 mt each segment (six nos. of SS 1/8 " of 1 mt length with 24 nos. of connectors which are used in the apparatus) **5)** In line(2 way) SS needle valves (V1 to V7) for fitting in the piping and these valves should withstand a working pressure of 3,000 psi (tested in 1.25 times) **6)** Pressure transducer : 0 to 5000 psi, 1 psi (Made in Germany/England & digital display Multispan, India). **7)** Pressure Gauge : 0 to 5,000(20 psi graduation, with calibration certificate)- 2 nos. **8)** Temperature sensor range 0 to 199.9^{0}C (PT 100 sensor, Japan & Digital display –Multispan) **9)** Hydraulic Working Cylinders (H.W.C) **10)** Capacity : 200 CC, Internal Pressure 3,000 psi. **11)** HWC- 1,2,3 to fabricated from 316 Stainless steel) to withstand 4,000 psi (tested 1.25 times) **12)** Hydraulic Hand pump (HHP) complete with a pressure gauge of 10,000 psi to develop a pressure of 7,500 psi with an MS tank of 10 liters capacity (with a detachable cover) with a 400 mesh strainer funnel. Make best of India. **13)** Electrical oven with digital display system and thermostat etc.. with brackets to hold the core holder with necessary wiring arrangements to signal for temperature and pressure in core holder to data acquisition card. Max Temp. : 200^{0}C. Inside LX W X H: 1.0 x 0.5 x 0.75 mts. OEM authorization has to be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, OEM/Suppliers should have ISO & CE certified Manufacturer	**01**		

16. Petroleum Production Engineering Lab

S NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**MEASURING THE VISCOSITY USING BROOKFIELD VISCOMETER**	Machine should be compliance with ASTM standard Supplied along with standard set of accessories for operation on 220Volts 1 X Main Viscometer 1 X Lab. Viscometer Stand 1 X Guard Leg 1 X Spindle Set (Spindle No. 1 to 4) 1 X Spindle Box 1 X Carrying case 1 X Instruction manual Brookfield Digital Viscometer LVDV-E Features : - Low cost digital viscometer - New Keypad Control - Sharp Viewing Screen for close up or distance viewing - No Calculations required - Direct reading of Viscosity in cP or mPa*s - 18 speeds for complete range capability Brookfield Digital Viscometer LVDV-E Specification : Min. Viscosity Range: 15Cp Max. Viscosity Range: 20 Lac Cp Speeds : 0.3 - 100 RPM Speed Increments : 18 Accuracy : +/- 1.0 % of range Repeatability : +/- 0.2 % Supplied complete with 1000 CPS BROOKFIELD GENERAL PURPOSE SILICON FLUID, Brookfield Silicone Viscosity Standards provide a convenient, reliable means of checking the calibration of most Brookfield Viscometers/ Rheometers. These fluids calibrated at 25°C are available in 11 different viscosity ranges. with NIST traceable Certificate OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		

2.	**DEAN & STARK APPARATUS (WATER CONTENT)**	Machine should be compliance with ASTM standard ASTM D-95, IS:1448 (P-40), Manually operated model. Consists of 1 liter single neck Round Bottom Flask, Dean & stark receiver, water cooled glass condenser and 5ml water trap, 1 Liter Heating Mantle, MS stand with rod and clamp provided. Power supply : 230 +10% Volt AC, 1 Phase, 50 Hz. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		
3.	**SEDIMENT AND WATER ANALYSER (OIL CENTRIFUGE)**	Machine should be compliance with ASTM standard ASTM D-91, ASTM D-96, Table top model. This standards above describe a quick method for determination of water and sediment content, which may cause trouble. The unit is provided with stepless speed control, speed meter, 1-99 Mts. Digital timer, zero interlock switch, dynamic brake and protective fuses. - With centrifuging chamber, 1 swing out rotor head, 4 metal carriers with rubber cushion. - 4 Nos. tapered bottom centrifuge tubes supplied. - Centrifuge tubes. DC motor with DC drive. - RPM meter with variable speed control. - Fulfills international safety requirements. - Maximum rpm 2000, Maximum RCF 1480 x g (without rotor head) - Table top model for 165 mm long with 100 ml capacity tapered bottom Centrifuge tubes. - Power supply : 220 +10% Volt, 1 Phase, 50 Hz. OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		
4.	**Viscometer**	Machine should be compliance with ASTM standard Features · Stepping Motor means Accurate, reliable operation · Direct readout of all measurement parameters · Auto Range Showing · Time Function for measurement · Sound alarm at under 20% Torque · Linear calibration · Wide range power supply:100V-240V Measuring Range(mPa.s)20-2,000,000 m.pas RPM 0.3, 0.6, 1.5, 3, 6, 12, 30, 60 No of Standard Spindles #1,#2,#3,#4 is standard configuration ,(#0 is for option) Measurement Accuracy ±1.0% of range Repeatability ±0.5% Display LCD Touch Screen Display	**01**		

		Temperature RTD Monitoring Sensor Probe Yes Output RS 232 Interface Power Supply AC 220V/50Hz Weight less than 10 kg OEM/Dealer authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
5.	**CONDUCTIVITY METER**	• EC Range 0.00 to 29.99 µS/cm, 30.0 to 299.9 µS/cm, 300 to 2999 µS/cm, 3.00 to 29.99 mS/cm, 30.0 to 200.0 mS/cm, up to 500.0 mS/cm (absolute EC)** • EC Resolution 0.01 µS/cm, 0.1 µS/cm, 1 µS/cm, 0.01 mS/cm, 0.1 mS/cm • EC Accuracy ±1% of reading (±0.05 µS/cm or 1 digit, whichever is greater) • EC Calibration 1 point offset calibration (0.00 µS/cm in air), 1 point slope calibration in EC standard 84 µS/cm, 1413 µS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm and 111.8 mS/cm • TDS Range 0.00 to 14.99 ppm (mg/L), 15.0 to 149.9 ppm (mg/L), 150 to 1499 ppm (mg/L), 1.50 to 14.99 g/L, 15.0 to 100.0 g/L, up to 400.0 g/L (absolute TDS)** • TDS Resolution 0.01 ppm, 0.1 ppm, 1 ppm, 0.01 g/L, 0.1 g/L • TDS Accuracy ±1% of reading (±0.03 ppm or 1 digit, whichever is greater) • TDS Calibration through EC calibration • EC/TDS Temperature Compensation Automatic - 5 to 100° C (23 to 212° F); NoTC - none absolute conductivity. • Temperature Correction Coefficient0.00 to 6.00% / °C (for EC and TDS only). Default value is 1.90% / °C • EC to TDS Conversion Factor 0.40 to 0.80 (default value is 0.50) • Salinity (% NaCl) Range 0.0 to 400.0% NaCl • Salinity (% NaCl) Resolution 0.1% NaCl • Salinity (% NaCl) Accuracy ±1% of reading • Salinity (% NaCl) Calibration Single point with HI 7037L Standard • Salinity (PSU) Range 2.00 to 42.00 PSU • Salinity (PSU) Resolution 0.01 PSU • Salinity (PSU) Accuracy ±1% of reading • Salinity Range 0.0 to 80.0 g/L* • Salinity Resolution (ppt) 0.01 g/L • Salinity Accuracy (ppt) ±1% of reading • Temperature Range -20.0 to 120.0 °C ; -4.0 to 248.0 °F** • Temperature Resolution 0.1 °C; 0.1 °F • Temperature Accuracy ±0.5 °C; ±0.9 °F • EC/TDS Probe HI763100 EC/temperature probe • Logging Type Manual Log on Demand (Max. 200 logs); Manual Log on Stability (Max. 200 logs); Interval Logging 100 lots, Max. 600 logs/lot • Logging Memory Up to 1000 records	**01**		

		• Connectivity 1 micro USB port for charging and PC connectivity, 1 USB port for storage • GLP yes • Battery Type/LifeBuilt-in rechargeable battery with up to 8 hours of continuous use • Power Supply 5 VDC adapter (included) • Environment 0 to 50°C (32 to 122°F), RH max 95% non-condensing • Dimensions 202 x 140 x 12.7mm (8" x 5.5" x 0.5") • Weight 250 g (8.82 oz) • OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			

17. Petroleum Product Testing Lab :

S. NO	ITEMS NAME	SPECIFICATION	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**Measurement of fire point- Flash point**	Machine should be Compliance with ASTM D-93, IP 34 and IS:1448, P-21. Manually operated. CUP : The apparatus consist of a brass test cup with handle. The flange of the cup is equipped with devices for locating the position of the cup in the store. Outer jacket with nozzle for cooling provided. Metallic handle fixed on the cup. COVER : The cover of the cup is of brass and is having a rim projecting downward almost to the flange of the cup. Metallic handle fixed on the cover. SHUTTER : The cover is also provided with spring operated rotating brass shutter having pilot jet. FLAME EXPOSURE DEVICE : The flame exposure device is having a tip with an opening. This device is equipped with an operating mechanism which, when the shutter is in the open position depresses the tip so that the center of the orifice is between the planes of the under and upper surface of the cover. PILOT FLAME : A pilot flame is provided for automatic relighting of the exposure flame. The tip of the pilot flame burner is having an opening of the same size as the tip of the flame exposure device. STIRRING DEVICE : The cover is equipped with an electric driven stirring device mounted in the center of the cover having motor in the control panel housing with 90–120rpm & 240-260rpm, dual speed out-put sockets. AIR BATH AND HEATER : The assembly rests in air bath, which is covered with dome shape metal tip. It provided with round shape electric heater with temperature regulator. TEMPERATURE CONTROL : Energy regulator temperature controller with digital temperature indicator for accurately regulating temperature of the oil bath. Certified thermometers ASTM 9C and 10C (1 No. each) will be Should . Contd. On Page No. GAS CONTROL VALVES : Provided on the top of the housing. SALIENT FEATURES : - Air arrangement for cooling - Stand for cup lid with fix handle - Gas ON/OFF valve to be fixed on plate - Stand for placing cup is fixed on the body - Dual speed out-put. Suitable for operation on 230 +10% volts, 50 cycle AC circuit. Continuity tests with visual and audio alerts Built-in LED flashlight helps you troubleshoot in dimly lit areas Low impedance mode, ZLOW, eliminates ghost voltage and improves measurement accuracy Non-contact voltage detection, Vsense, alerts you, without probing, when high AC voltage presence is detected in hot or live wires 500 hours of battery life and Keysight Remote Link Solution enabled (wireless data logging via Bluetooth®) CAT III 600V Overvoltage Protection. OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan; Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	01		
2.	**Measurement of Cloud point and pour point.**	Machine should be Compliance with ASTM D-97, ASTM D-2500, IP15, ISO:3016 & DIN 51597. The equipment quoted to you is having automatic temperature controller. Only the sample reading has to be done manually. Cloud & pour point are indicators of the lowest temperature of utility for petroleum products. The sample is periodically examined while it is being	01		

		cooled in the cloud & pour point tester. The highest temperature at which haziness is observed (cloud point) or the lowest temp at which movement of the oil is observed (pour point) is reported as the test result. MODEL: 3, 4 & 5 Compartment model. Each compartment is designed to accommodate 4 test jars at a time. CONSTRUCTION : Each chamber is made of stainless steel interior & exterior is a single unit made of mild steel duly powder coated. The top surface is made of thick Teflon sheet. Each compartment is having 4 test jackets. INSULATION : All compartments are sufficiently insulated by PUF to minimize heat exchange. CONTROLLER: All the compartments are having individual Micro-PID temperature controller with digital indicator and PT-100 sensor. COOLING KIT : All the compartments are having separate cooling kit which include hermetically sealed 'Emerson' make compressors, over load protector, oil separator, dryer, fan motors, condensers, cascades, CFC free refrigerant which are safely placed below the chamber. TEMPERATURE : Compartments can be set for the following temperature ranges. Compartment-1 : –1 0C to –2 0C. Compartment-2 : –150C to –180C. Compartment-3 : –320C to –340C. Compartment-4 : –470C to –510C. Compartment-5 : –670C to –710C. COMPARTMENT SIZE : Inner size of each compartment is 200 diameter x 175 mm H. ACCESSORIES : Test jars with rubber cork Should . Glass thermometers conforming to ASTM 5C & ASTM 6C with calibration certificate provided. POWER SUPPLY : 230 +10% Volt AC, 1 Phase, 50 Hz. BATH TEMPERATURE: a) 00C, –170C, –340C. (3 compartments model) SAMPLE TEMP. : +80C, –9 0C, –260C. Continuity tests with visual and audio alerts Built-in LED flashlight helps you troubleshoot in dimly lit areas Low impedance mode, ZLOW, eliminates ghost voltage and improves measurement accuracy Non-contact voltage detection, Vsense, alerts you, without probing, when high AC voltage presence is detected in hot or live wires 500 hours of battery life and Keysight Remote Link Solution enabled (wireless data logging via Bluetooth®) CAT III 600V Overvoltage Protection. OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
3.	**Measurement of Aniline point &Bromine number**	Machine should be Compliance with ASTM D 611, IP 2/84. Manually operated model. Method D. By 'U' tube method. Complete with jacket, electrically heated with motorized stirrer. Glass thermometer, Low/Medium/High Aniline point, with calibration certificate provided, traceable to National standards. Power supply : 230 +10% Volt AC, 1 Phase, 50 Hz. OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		
4.	**Measurement of Reid Vapour Pressure**	Machine should be Compliance with ASTM D-323, IP69, IS:1448 (P-39). BATH CONSTRUCTION : Bath for Double test. The main reservoir is made of 16 SWG, 304 AISI, corrosion resistant stainless steel buffed to mirror polish. Outer body made	**01**		

		of 20 SWG, CRCA sheet duly powder coated. Thermal insulation provided in between the walls to prevent temperature loss. The bath is having drop-in lid with handle. The bath depth will be such that, the vapour pressure bomb is immersed to at least 25mm above the top of air chamber. DRAIN VALVE : The liquid reservoir is provided with 3/8" stainless steel ball valve. HEATING SYSTEM : Immersion heaters fitted to help achieve above ambient temperature. Heater is inter connected to the PID output. Heater wiring done using Teflon coated cable. CIRCULATORY SYSTEM : Fractional Horse Power motor (FHP) drives stirrer to helps maintain uniform temperature across the bath media. This circulatory system also helps maintain the measuring and reaction temperature within the liquid bath. TEMPERATURE CONTROLLER AND INSTRUMENTATION : Microprocessor based PID temperature controller with two displays for set and process value with feather touch key board and PT-100 sensor incorporated. ACCESSORIES : Vapour pressure bomb constructed of brass plated consisting of one air and one gasoline chamber without cock-2 Nos., Gasoline chamber with cock-2 Nos., Pressure Gauge-2 Nos. & 'O' ring seals-2 Nos. Should . TECHNICAL DATA : MOC inner : 304 Stainless steel. MOC outer : Epoxy Powder Coating. Control System : Microprocessor based PID with PT–100 sensor. Bath Heater : 2 Kw. Circulatory Motor : 1/12 HP, 1440 rpm. Total Rating : 15 Amps. Temperature range : Above ambient to +1000C. Temp. accuracy : +0.50C. Bath capacity : 2 Place Constant Temperature Bath. Power supply : 230 +10% Volt AC, 1 Phase, 50 Hz. OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			
5.	**Measurement of Carbon Residue.**	Machine should be Compliance with Compliance with ASTM D-524, IP 14. This test method covers the determination of the amount of carbon residue left after evaporation and pyrolysis of an oil and it is intended to provide some indication of relative coke-forming propensity. This test method is generally applicable to relatively nonvolatile petroleum products which partially decompose on distillation at atmospheric pressure. Made of solid metal, having cocking bulb wells 25.45 +0.1mm in internal diameter and 76mm deep to the center of the well bottom, with suitable arrangements for heating to a uniform temperature of 5500C. The bottom of the well shall be hemispherical to accommodate the bottom of the glass cocking bulb. High temperature ceramic wool insulation lagged in between the walls to prevent loss of temperature. Outer casing made of 20 SWG, 304 AISI, stainless steel buffed to matt finish. Comprising of Coking furnace with 5 bulb wells, (4 each for coking bulbs and 1 for the control bulb). Temperature is accurately controlled and maintained by fully automatic microprocessor based PID temperature controller with two displays for set and process value with feather touch key board & thermocouple incorporated. Should with Coking bulb-5, Control bulb-1 & Charging syringes-1. Power supply 230 +10% Volt AC, 1 Phase, 50 Hz. OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within	**01**		

		the specified tolerance limits.			
6.	**ASTM Distillation of Petroleum Products.**	Machine should be Compliance with ASTM D-86, IP 123 & IS:1448 (P-18), manually operated. Single test unit. Electrically heated model complete with glass parts and geared heater with copper coil type voltage variac control. Consist of... Single distillation unit.• Distillation apparatus with electric heating source as per ASTM D-86.• Condenser + Cooling tank (non-refrigerated) : Tank is made of stainless steel with facility for• draining/overflow. Condenser made of stainless steel seamless non-corrosive tubing, dimension as per above test method. The dimensions, position•& angle of the tubing & condenser bath is as per standard. Heat source : Electric heater adjustable from 0 to 1000 watts. Metal shield for flask is provided.• Shield made of mild steel with locking arrangement, toughened glass front view window and indicator• lamp. Body of the apparatus is made of 20 SWG, CRCA sheet duly powder coated. Adjustable flask support with platform made of ceramic heat resistant material with a central opening 38• to 50mm in diameter. Distillation flask made with heat resistant borosilicate glass of 125ml capacity with dimensions as per• standard, provided with Teflon cork. Receiving Cylinders of borosilicate glass of 100 ml capacity with 1 ml intervals with dimensions as per• standard. Should with ASTM 5C•& ASTM 6C thermometers calibrated by NPL traceability–1 each, Distillation flask–1 No., 100ml measuring cylinders–1 No. & Schott Duran make Ceran glass base plate for 38mm dia hole & 50mm dia hole – 1 No. each Should . Power supply : 230 +10% Volt AC, 1 Phase, 50 Hz.• OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		
7.	**Determination of smoke point.**	Machine should be Compliance with ASTM D-1322, IP 57, IS:1448 (P-31). It is indicator of the combustion qualities of avaiation turbine fuels and kerosene. The fuel sample will be burned in the smoke point lamp and the maximum flame height obtainable without smoking measured. Consists of brass lamp body with chimney, gallery, 0-50mm black glass scale with white markings, brass plated door with curved glass window, candle socket and plated brass candle with wick tube and air vent. It is mounted on a cast iron base with aluminum support rod.OEM authorization Should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.	**01**		
8.	**Surface tensiometer**	Surface Tensiometer with Surface tension and interfacial tension measurement capability compliance with ASTM D971. Measurement method du Noüy Ring method by using Platinum ring Measurement scale indication 0 – 180 degrees Resolution – 0.2 dynes/cm Measurement temp. Room temperature	**01**		

		Operation Manual in English Accessories: Sample Platform, Platinum ring x1, Glass lab dish x4, Storage box x1, Ring dressing kit OEM authorization should be compulsorily attached with the technical bid. OEM should have the Authorized Service Center in the State of Rajasthan, Manufacturer should have comprehensive production facility, after sales service facility & infrastructure, Accredited Calibration and Quality Control Test Laboratory and R & D centre duly recognized by Department of Scientific and Industrial Research, Ministry of Science and Technology. OEM/Suppliers should have ISO & CE certified Manufacturer who can ensure the manufacturing of the machine as per the required testing standards/BS/BIS/ASTM standards and within the specified tolerance limits.			

18. Seperation Process Lab :

S. NO	ITEMS NAME	SPECIFICATIONS	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**To determine diffusior coefficient of liquid va**	Using a small sample of the liquid in a narrow vertical tube, and observing its rate of evaporation into stream of air passed across the top of the tube can conveniently be used to study the diffusion of vapour of a volatile liquid into air. The set up consists of a glass tube placed in a water bath. A horizontal glass tube is fixed to the upper end of the tube and air is drawn through this by a small air pump included within the unit. Air flows over this tube maintaining partial pressure difference. A Traveling microscope with sliding vernier scale is provided to measure the rate of fall of solvent within capillary. A stirrer is fitted to maintain constant temperature inside the bath.	01		
2.	**To study the mass transfer characteristics of a wetted wall column**	The set up consists of a glass column. Water is fed at the top of t along the walls to make the column a wetted wall column. Hot air fr chamber with known humidity is allowed to pass through the colum upward and evaporation in the liquid film around the wall takes plac rates of water and air can be independently varied to simulat conditions. Instrumentation is provided to measure the dry and temperatures at air inlet and outlet.	01		
3.	**Liquid-liquid extractio packed column for co and counter current fl binary systems**	The set-up consists of a glass column packed with Rasching rings. counter current contacts between the solvent and solute phases is m results into extract and raffinate streams. Flow meters (Rotameters) note the flow of solvent & solute respectively. The continuous an phase streams are metered and derived from separate containers. Th up is housed in a well-designed rigid structure. The structure als tanks, piping, Rotameters, panel and other units.	01		
4.	**To study the absorptio in a packed column an calculation of NTU and**	The set up consists of a glass column packed with Rasching rings. L at the top of the column through distributor. The solute gas a measured separately, mixed in a mixing chamber and then passed t packed column vertically upward and absorbed in liquid. All the flo be independently varied to simulate different conditions. Liquid sam taken out from the sampling point at the bottom of the column for an	01		
5.	**Studies on solid-liquid column. Studies on the plate distillation unit**	This setup is designed to study the performance characteristics of solvent extraction of a particular component from a packed bed of solid material. The apparatus allows study of such systems as water/inorganic salts, water/sugar bed, methylene chloride/vegetable oil etc. The glass column is fitted with SS mesh to support the solid material. The solvent is introduced near the bottom of the column and it flows upward counter-currently to the solids. A pump supplies the solvent and flow rate is monitored by means of a Rotameter. Solvent feed tank is kept in a bath fitted with heater and digital temperature controller is used to maintain the constant temperature. EXPERIMENTATION :- □ To study the effect of various system parameters like, solvent temperature, solvent rate and particle size on the %age recovery of oil from solid.	01		

19. Antenna Design Lab :

S. NO	ITEMS NAME	SPECIFICATIONS	QTY	UNIT PRICE	TOTAL PRICE INCLUDING GST
1.	**VECTOR NETWORK ANALYZER (6.5 GHz USB Based Two Port Vector Network Analyzer)**	1. Frequency Range 300 kHz to 6.5 GHz 2. Number of Ports Full Two Port (3.5mm female) 3. Frequency Accuracy ± 1 ppm 4. Ageing Rate < 3.5 ppm/year 5. IF Bandwidth 1 Hz to 1.2 MHz 6. Wide dynamic range > 115 dB at 6.5 GHz (10 Hz IFBW) 7. Test Port Maximum output power +10 dBm (typ.) 8. Low trace noise Magnitude: < 0.003 dBrms (1 kHz IFBW) Phase: 0.030 deg rms 9. Phase Noise >-80 dBc/Hz at 5GHz and 10KHz offset 10. Noise Floor -110dBm at 10 Hz IF Bandwidth 11. High temperature stability 0.005 dB/degree C up to 6.5 GHz 12. Source Harmonics (at 6GHz) -10 dBc at maximum power 13. Measurement speed 24 msec (201 points, full 2-port cal and 100 kHz IFBW) 14. Receiver Compression ≥ +7 dBm for entire frequency range 15. Future Upgradable features Frequency can be upgraded upto 26.5GHz Automatic fixture removal Time domain analysis Scalar calibrated mixer/converter measurements Multiport calibrated measurements, Material Measurements Operating Temperature 0 to 55 deg. C Connectivity USB 3.0 port and suitable PC/Laptop system should be provided along with analyzer 16. Accessories Necessary cable and calibration kit should be provided Warranty Standard 3 year warranty for instrument and 1 year for accessories. OEM/distributor authorization should be compulsorily attached with the technical bid. OEM/distributor should have the Authorized Service Center in the State of Rajasthan.	01		