

- Tender Enquiry No : UIT/31/2010

Barkatullah University Bhopal
Hoshangabad Road Bhopal 462026, M P India

Barkatullah University, Bhopal M P would like to procure equipments at a total cost of approximately Rs. 1 Crore for its day to day teaching and research in the University Institute of Technology. The list of equipments to be purchased can be seen on the website **www.bubhopal.nic.in** or **www.buit.ac.in**.

- Due Date & Time : 06/12/2010, 2.30PM
(For submission of Bids)

- Opening of Technical Bids : 06/12/2010, 3.00PM at Office of Registrar.

Prospective Bidders may download the Tender Documents from the Institute website: www.bubhopal.nic.in or www.buit.ac.in and submit their offers alongwith a draft of Rs. 2000/- payable to the Registrar, Barkatullah University, Bhopal towards cost of Tender documents. Sealed Tenders addressed to the Registrar Barkatullah University, Bhopal should be submitted **BY POST in the Office of the **Director University Institute of Technology, Barkatullah University, Bhopal-462 026, M P , India.****

Registrar, BU, Bhopal

Tender Enquiry No : UIT/31/2010

**LIST OF EQUIPMENTS TO BE PURCHASED FOR
UNIVERSITY INSTT OF TECHNOLOGY,
BARKATULLAH UNIVERSITY, BHOPAL**

APPLIED THERMODYNAMICS LABORATORY

S. No	Name of the Equipment
1.	Steampower Plant
2.	Centrifugal Air Compressor Test Rig

HEAT & MASS TRANSFER LABORATORY

S. No	Name of the Equipment
3.	Shell And Tube Heat Exchanger
4.	Heat Transfer In Natural Convection Apparatus
5.	Heat Transfer In Forced Convection Apparatus
6.	Stefan Boltzmann Apparatus
7.	Heat Transfer Through Composite Wall Apparatus
8.	Heat Transfer Through Lagged Pipe Apparatus
9.	Parallel Flow/ Counter Flow Apparatus
10.	Heat Transfer From A Pin Fin Apparatus
11.	Thermal conductivity of metal rod.
12.	Film wise and drop wise condensation Apparatus

I.C. ENGINES LABORATORY

S. No	Name Of the Equipment
13.	Four Stroke Single Cylinder Petrol Engine Test Rig
14.	Computer Based Four Cylinder Four Stroke Petrol Engine With Hi Speed Data Acquisition System
15.	Variable Compression Ratio Engine Test Rig with Hi Speed Data Acquisition system(DAS)
16.	Computer Based Single Cylinder (Vertical) Diesel Engine Test Rig with Hi Speed Data Acquisition System
17.	Smoke Meter

FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

S. No	Name of the Equipment
18.	Orifice Meter Apparatus
19.	Flow Measurement by Venturi Meter and Orifice Meter Recirculation type
20.	Verification Of Bernoulli's Theorem Apparatus Recirculation Type
21.	Flow Through Mouth Piece And Orifice Instrument Recirculation Type
22.	Reynolds Apparatus (Recirculation Type)
23.	Pelton Wheel Turbine Test Rig. {5 h. P.} (Closed-Circuit)
24.	Francis Turbine test rig (5 hp)
25.	Kaplan Turbine Test Rig (5 h.p.) Close Circuit
26.	Reciprocating Pump test rig. (Recirculation type) (D. C. Motor variable speed)
27.	Single Stage Centrifugal Pump Test Rig (3 h.p.) (recirculation type)

MATERIALS SCIENCE AND NANOTECHNOLOGY LABORATORY

S. No.	Name Of the Equipment
28.	Scanning Probe Microscope
29.	X ray powder Diffraetometer
30.	Programmable Scanning Potentiostatand Galvanostat
31.	Zeta Potential Measurement Apparatus

INFORMATION TECHNOLOGY

S.NO	EQUIPEMNT NAME
32.	Basic CDMA /GSM Trainer
33.	Lan Trainer
34.	Data Communication Trainer
35.	Bluetooth Technology Trainer

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CHAPTER-1. INVITATION FOR BIDS

1. Barkatullah University, Bhopal M P would like to procure the following equipment for its day to day teaching and research in the University Institute of Technology.

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35.	Bluetooth Technology Trainer

The Technical Specifications are given in Chapter 4:
Schedule of Requirements/Specifications and Allied Technical details are appended herewith.

- The Bidders are requested to give detailed tender in their own forms in two Bids i.e
Part -I Technical Bid.
Part -II Commercial Bid.

3. Contact for information:

Technical contact :

Director, University Institute of Technology (UIT). Barkatullah University(BU/
The University), Bhopal 462 026,

M P, India.

Tel : +91-0755 2491742

Fax : +91-0755 2491741

Website : www.buit.ac.in

Commercial Contact:

Registrar, Barkatullah University, Bhopal 462 026, M P India.

Tel : +91-0755 2491707

Fax : +91-0755 2491706

Website : www.bubhopal.nic.in

4. The tender document can be downloaded from the UIT website www.buit.ac.in

5. Supply means : “Supply, Installation, Commissioning and satisfactory demonstration of the whole system and training”. If any charges extra are payable for Installation, Commissioning and training, the same should be specified in the commercial offer.

6. Submission of Bids :

(a) Place : Purchase Section of UIT, BU, Bhopal

(b) Time and Date of Submission : on or before 06/12/2010, 2.30 PM

(c) Time and Date of opening Technical Bid : At 06/12/2010, 3.00 PM

Registrar Barkatullah University will not be responsible, for submission / delivery of quotation at wrong places other than the office(Purchase Section) of the Director UIT, Barkatullah University Bhopal.

7. Two Bid System :

The two bid system should be followed for this tender. In this system the bidder must submit his offer in two separate sealed envelopes. Both the technical bid and commercial bid envelopes should be securely sealed and stamped separately and clearly marked as “**Envelope No.1 – Technical Bid For (name of equipment)**” and “**Envelope No.2 – Commercial Bid for (name of equipment)**” respectively.

Both the sealed envelopes should be placed in a third larger envelope. The main envelope which will contain both the bids and a draft of Rs 2000/- towards cost of tender document, should be super scribed with our tender enquiry number and name of equipment and to be submitted **BY POST** to the address given below so as to reach on or before the due date at the following address:

Director
University Institute of Technology
Barkatullah University
Bhopal 462 026, India

The envelopes must be super-scribed with the following information:

- Tender Reference Number and name of item
- Due Date
- Name of the Vendor

Envelope No. 1 : Shall contain “Technical Bid” and Earnest Money Deposit (EMD)

The technical offer shall not contain any price information.

The Technical Bid must be submitted in an organized and structured manner. No brochures/ leaflets etc. should be submitted in loose form. Please indicate page nos. on your quotation eg. if the quotation is containing 25 Pages, please indicate as 1/25, 2/25, 3/25 -----25/25.

The Technical Offer shall comprise of the following:

- a) Tenders, which are submitted without following the two bid offer system, will summarily be rejected.
- b) The technical bid shall contain commercial terms with reference to the tender.
- c) The technical offer shall be complete to indicate that all products and services asked for are quoted. Each page of the bid and cutting/corrections shall be duly signed and stamped by the bidder. Unsigned Tenders will also be rejected. Failure to comply with this requirement may result in the bid being rejected.
- d) The purpose of certain specific conditions is to get or procure best Equipment/service etc. for UIT, BU Bhopal. The opinion of Technical Committee shall be the guiding factor for technical short listing.
- e) Demand Draft/Bank Guarantee towards Earnest Money Deposit. B.G. will be obtained from Nationalised / Scheduled Bank only.
- f) Undertaking that the successful bidder agrees to give a security deposit amounting to 10% of the purchase order value by way of Demand Draft in favour of The Registrar Barkatullah University, Bhopal should be submitted and the same should accompany with complete specifications, Manufacturer’s name, address and relevant Technical Literature/Brochures with warranty Terms and EMD.
- h) The import license is covered under OGL policy (for the specific equipments to be imported).
- i) If the bid is for branded makes, authorization letter from principals clearly indicating that the vendor is the competent authority to sell and provide services towards the items mentioned in the scope of supply given in this tender document.
- j) Agreements / Purchase Orders / Completion certificates if any, for similar equipment to other Universities/Institutes, the details of such supplies for the preceding three years should be given.
- k) Solvency certificates (not older than twelve months) issued by Scheduled/ Nationalized bank with which bidder holds the current account.
- l) Copy of LST/CST/WCT No. PAN No. and TIN No. allotted by the concerned authorities. If registered with the National Small Industries Corporation, the registration number, purpose of registration and the validity period of registration and a copy of DGS&D registration wherever it is applicable should also be provided in Technical Bid.

- m) A copy of the Un-priced Commercial Bid. (Please see Chapter-5 – Price Schedule).
- n) The prices should be shown against each item for the purpose of Insurance claims / replacements if any.
- o) List of deliverables / Bill of materials and services.
- p) Compliance sheet with any deviation with reference to the terms and specifications.
- q) In case of Foreign quote, the address of Principal's / Manufacturer's and their Banker's details shall be furnished.
- r) Indicate the names of the Indian reputed Organizations where you have supplied similar equipment and may attach the satisfactory performance report of the equipment from user Organization.
- s) The item supplied with manuals including technical drawings shall be complete in all respects to operate the system without any problem.
- t) Duly filled in checklist as per Chapter 7 should be submitted along with the Technical Bid.

Bid documents should be submitted as per the above sequence with Index page and page numbers (including technical literature). Each page of the bid should be signed & stamped in original. Unsigned bids will not be considered for evaluation.

Envelope 2 : “Commercial Bid” shall contain:

- a) Price schedule complete in all respects with proper seal and signature of authorized person. It should also contain the Comprehensive AMC charges for post warranty period as per the terms of the tender. The optional and any other essential items / accessories required for the maintenance of the equipment for the next ten years should also be specified in the offer separately. Discount offered should be mentioned clearly in the commercial bid only.
- b) Cost of all the items should be mentioned clearly and individually in the Commercial Offer (Part-II) only.
- c) The Bidders are requested to quote for Educational Institutional Price for Equipment and software, since we are eligible for the same.

8. Date of opening the Technical Bids.

- Technical Bids will be opened on 06/12/2010 at 03.00 PM in the Office of the Registrar, Barkatullah University, Bhopal 462 026, M P India .
- The Technical bids will be opened in the presence of the bidders on the specified time and date. Bidders/Agents who have responded to the tender only will be allowed to be present.
- The technical bids will be evaluated to shortlist the eligible bidders. The commercial bids of only the short listed bidders shall be considered for further processing.
- Bidders whose technical offer is found acceptable and meeting the eligibility requirements as specified in this tender will be informed about the date and time of the opening of the commercial bid.

Note : (1) Please do not insert ‘Commercial Bid’ (prices quoted) in the technical bid envelope. If the price quoted is submitted with technical bid the tender will be rejected.

(2) No camera / mobiles are allowed during tender opening.

9. Terms of the Technical Committee:

- 1) A committee duly constituted by the Vice Chancellor will go through the technical aspects of the tender and recommend short listed firms. The recommendation of the technical committee is final and binding on all the parties.
- 2) The technical evaluation will be an assessment of the Technical Bid. The University will proceed through a detailed evaluation of the Technical Bids as defined in Chapter IV (Schedule of requirements, specifications and allied technical details), in order to determine whether they are substantially responsive to the requirements set forth in the tender. In order to reach such a determination, the University will examine the information supplied by the Bidders, and shall evaluate the same as per the specifications mentioned in this tender.
- 3) The technical committee may formulate evaluation criteria in addition to the specifications and requirements indicated in the tender, in the interest of the University and this criteria/recommendation will also form as a part of short-listing of the firms.
- 4) The Technical Committee will examine all the Technical aspects of the bids received. Further, the Technical Committee may seek additional information from the existing users and also call for Technical presentations from the bidders if it is required so.

10. Evaluation Criteria:

- 1) On the due date the Technical bids will be opened and referred to the Technical Committee which is duly constituted by the Vice Chancellor.
- 2) The information received and the bids already submitted together will be examined with reference to the tendered specifications and evaluation is made by the Technical Committee.
- 3) After the technical evaluation is completed and approved, the University shall inform to the bidders whose bids have been rejected technically with the reasons for rejection.
The commercial offers of the vendors whose technical offers are found to be Technically deficient or do not meet the qualification criteria as specified in this tender will be returned to them without opening along with their EMD.
- 4) The successful bidders will be informed regarding the date and time of Commercial bid opening
- 5) The purpose of obtaining two bids (technical and commercial) is to evaluate all the firms on technical basis with reference to the tendered specifications, performance of similar Solutions/Applications elsewhere, obtaining users views with reference to the earlier supplies. This will enable the technical committee to arrive at a fair recommendation in the interest of the University.
- 6) In the event of seeking any clarification from various bidders by the University, the bidders are required to furnish only technical clarifications that are asked for. No amendment to commercial bid will be entertained at that stage. In case if a bidder fails to quote for all the accessories desired for a particular item it amounts to non-compliance and hence such bid will not be considered for further evaluation. Further during this process if any bidder indicates the price during the clarification such bids also will not be considered for further evaluation.

11. Opening of Commercial Bids

The University will open commercial bids of only the short listed bidders, in the presence of the bidders or their authorized representatives who choose to attend the commercial bid opening. The Date and Time of opening the Commercial Bid will be intimated only to pre-qualified and technically acceptable Bidders. The representatives of short listed firms only will be allowed for commercial bid opening.

The bidder's representative who is present shall sign an attendance register as a proof of having attended commercial bid opening.

The bidder's name, bid prices, discounts, EMD and such other details considered as appropriate by the University, will be announced at the time of opening.

ONLY TECHNICALLY accepted competitive bids will be considered for placing Purchase Order.

- a) After the opening the commercial bids, the offer of the bidders will be tabulated with reference to the specifications and compared on FOB basis only.
- b) Though the comparison is made on FOB basis, the bidders are required to provide the estimated cost of freight & insurance up to Delhi i.e. CIF New Delhi.
- c) For items manufactured in India, the cost may be quoted including free delivery to the Institute premises.
- d) After arriving at final pricing of individual offers of all the short listed firms, the lowest firm will be awarded with Contract/Purchase Order.

The bid can be submitted in person or through post/courier (BU will not be responsible for delayed / late quotations submitted / sent by Post / Courier etc. resulting in disqualification/ rejection of any bid) so as to reach Director UIT, BU, Bhopal on or before the due date and time. Fax / E-mail tenders will not be considered unless it is asked for. The bidders' authorized representative can attend the bid opening.

12. No request for extension of due date will be considered under any circumstances.

13. No sub-contracting is allowed with regard to installation, commissioning, training, warranty maintenance and after sales service. This is the sole responsibility of the Principals'/their authorized agents.

14. The University reserves the right to accept the offer in full or in parts or reject summarily or partly.

CHAPTER-2 : INSTRUCTIONS TO BIDDERS

Delivery Period / Timeliness

The deliveries & installation must be completed within three months, after placement of purchase order. The time is the essence of the contract. It is mandatory for the bidders who respond to this bid to meet these expectations,

Locations for the Supply / Services :

The equipments are to be supplied and installed at the University Institute of Technology, BU, bhopal.

1. Eligible Bidders

- 1.1 This invitation for bids is open to all bidders who are in the business of supply & maintenance services or bidders who are in business of similar nature for at least three years.
- 1.2 For Branded items, only the authorized distributors / dealers / resellers are eligible to bid. In this case, the authorization certificate to this effect, issued by principals should be submitted along with the Technical Bids.
- 1.3 The University reserves the right to award / reject the order to any particular bidder without assigning any reason thereof.
- 1.4 Bidders should not be under a declaration of ineligibility for corrupt and fraudulent practices.
- 1.5 Bidders should QUOTE strictly in accordance with the requirements. The Bidders conditions printed on the reverse of the tender/quote or otherwise sent along with the tender shall not be binding on the University.
- 1.6 Bidders shall adhere to the procedure and processes laid down in this document and shall follow fair and ethical practices of trade.
- 1.7 Based on the list of installations provided by the bidder, the University will have its option to obtain details of the equipment, their performance, after sales services etc. for evaluation of the tender, directly from the concerned Labs./Scientists etc.
- 1.8 The tenders must be clearly written or typed without any cancellations/ corrections or overwriting.
- 1.9 The makes/brand and name and address of the manufacturer, Country of Origin, Country of Shipment and currency in which rates are quoted are to be mentioned.
- 1.10 Firms which have already supplied similar equipment to the University and have not completed required installation/commissioning/after sales service/warranty replacements etc. such firms offers will not be considered for further evaluation and no enquiries thereafter will be entertained.
- 1.11 Conditional Offers will not be considered.
- 1.12 The University will not provide any accommodation/transportation for the engineers/ representatives for attending installation, commissioning and demonstration work. It is the absolute responsibility of the Principal Supplier/Indian Agent to make their own arrangements.
- 1.13 The authorized person who signs the tender is required to indicate his e-mail ID, mobile No. and also general e-mail ID for easy and faster communication.

2. Amendment of Bidding Documents

- 2.1 At any time prior to the deadline for submission of bids, the University may, for any reason, whether on its own initiative or in response to the clarification request by a prospective bidder may modify the bid document.
- 2.2 All prospective bidders who have downloaded the bidding document may visit the website of the University Institute of Technology for amendments / modifications which will be binding on them.

PREPARATION OF BIDS

3 Earnest Money Deposit (EMD)

- 3.1 The tender documents must be accompanied by Earnest Money Deposit (EMD) of Rs 40,000/ in the form of a Demand Draft drawn on any Scheduled/Nationalized Bank in favour of the Registrar Barkatullah University Bhopal. The EMD can be submitted by the Bidder himself or by his Indian Agent.
- 3.2 The bidder who submits the tender on behalf of their principals should produce documentary evidence in support of their authority to quote or submit proforma invoice of their principals.
- 3.3 Bids submitted without EMD will stand rejected. EMD will not be accepted in the form of cash / cheque or any other form other than DD/Bank Guarantee. No interest is payable on EMD.
- 3.4 The EMD will be returned to the bidders(s)/Agents whose offer is not accepted by the University within one month from the date of the placing of the final order(s) on the selected bidder(s). In case of the bidder(s) whose offer is accepted the EMD will be returned on submission of Bank Guarantee as Security Deposit (SD). However, if the return of EMD is delayed for any reason, no interest / penalty shall be payable to the bidders.
- 3.5 The successful bidder, on award of contract / order, must send the contract / order acceptance in writing, within 7 days of award of contract / order failing which the EMD will be forfeited.
- 3.6 Though EMD has to be submitted by Demand Draft, Banker's Cheque or Bank Guarantee (from a scheduled Bank only), we prefer to have Bank Guarantee for easy return to the bidders once a decision is taken by the University (Specimen of Bank Guarantee is enclosed at Chapter -6).
- 3.7 The EMD shall be forfeited:
 - 3.7.1 If the bidder withdraws the bid during the period of bid validity specified in the tender.
 - 3.7.2 In case a successful bidder fails to furnish the Security Deposit.

4.Security Deposit :

- 4.1 Within ten (10) days of the award of contract, the vendor shall furnish a Security Deposit amounting to 10% of the purchase order value in the form of Demand Draft/Bank Guarantee (from scheduled Bank only) favouring the Registrar, Barkatullah University, Bhopal.
- 4.2 In case of bids in Foreign Currency, the Indian Representative / dealers can submit the EMD / Sight Draft in INR to the University without any relaxation.
- 4.3 The Security Deposit should be valid for a period of one year as we plan to extend the same as Performance Bank Guarantee.
- 4.4 Bank Guarantee wherever mentioned in this document may be read as “Bank Guarantee from any Scheduled Bank” only.

5. Amalgamation/Acquisition etc.:

In the event the Manufacturer/Supplier proposes for amalgamation, acquisition or sale of its business to any firm during the contract period, the Buyer/Successor of the Principal Company are liable for execution of the contract and also fulfilment of contractual obligations i.e. supply, installation, commissioning, warranty, maintenance/replacement of spares accessories etc.

While submitting your bid, you may confirm this condition.

6. Period of validity of bids:

- 6.1 Bids shall be valid for a period of 180 days from the date of opening the Technical bid.
- 6.2 The University may ask for the bidder’s consent to extend the period of validity. Such request and the response shall be made in writing only. The bidder is free not to accept such request without forfeiting the EMD. A bidder agreeing to the request for extension will not be permitted to modify his bid.
- 6.3 Bid evaluation will be based on the bid prices without taking into consideration the above corrections.

SUBMISSION OF BIDS

7. Deadline for submission of Bids:

- 7.1 Bids must be received by the University before the time & date at address specified in the tender. In the event of specified date for the submission of bids being declared as a holiday for the University, the bid-closing deadline will stand extended to the next working day. No communication is required in such cases.

8 Late Bids

The University will not be responsible:

- 8.1 For delayed / late quotations submitted / sent by post / courier etc.
- 8.2 For submission / delivery of quotations at wrong places other than the Purchase section of Director, UIT, BU, Bhopal.
- 8.3 Fax / E-mail / Telegraphic / Telex tenders will not be considered.
- 8.4 Any bid inadvertently received by BUIT, Bhopal after the deadline i.e. due date & time for submission of bids, will not be accepted and returned unopened to the bidder.

AWARD OF CONTRACT

9 Award Criteria

- 9.1 The University shall award the contract to the eligible bidder whose bid has been determined as the lowest evaluated commercial bid.
- 9.2 If more than one bidder happens to quote the same lowest price, the University reserves the right to award the contract to more than one bidder or any bidder.

10. Purchaser's Right to vary Quantities at the time of Award :

- 10.1 The University reserves the right at the time of award of Contract to increase or decrease the quantity of items specified in the Schedule of Requirements without any change in price or other terms and conditions.
- 10.2 Firms which have already supplied similar equipment to the University and have not completed required installation/commissioning/after sales service/ warranty replacements etc. such firms offers will not be considered for further evaluation and no enquiries thereafter will be entertained.

11. Cargo Consolidation and Customs Clearance:

The University shall appoint its own Freight Forwarder and Custom House Agent for all imports. Please note that all the consignments have to be routed through their associates only. The address and contact details will be provided at the time of placing the Purchase Order. While submitting your bid, you may confirm this condition. For tender offers under high sea sale agreement, the tenderer shall be responsible for all the formalities related to customs clearance etc.

12 Corrupt or Fraudulent Practices:

The University requires that the bidders who wish to bid for this project have highest standards of ethics.

- 12.1 The University will reject a bid if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices while competing for this contract.
- 12.2 The University may declare a vendor ineligible, either indefinitely or for a stated duration, to be awarded a contract if it at any time determines that the vendor has engaged in corrupt and fraudulent practices during the execution of contract.

13. Interpretation of the clauses in the Tender Document / Contract Document :

In case of any ambiguity / dispute in the interpretation of any of the clauses in this Tender Document, the University's interpretation of the clauses shall be final and binding on all parties.

CHAPTER -3 : CONDITIONS OF CONTRACT

1. Price:

- 1.1 The price quoted shall be considered firm and no price escalation will be permitted.
- 1.2 Bidder may bid in Foreign Currencies on behalf of their Principals or in INR.
- 1.3 The quotation should be only in Indian Rupees for indigenous items. In case of foreign quote, the vendors may quote their rates in Indian Rupees as well as in Foreign Currency.
- 1.4 In case of foreign currency bids, the price criteria should be on F.O.B. basis.
- 1.5 Packing, forwarding, freight, insurance and commissioning charges, if any extra may be quoted separately in Commercial Bid.
- 1.6 In case your quotation is Ex-works/F.O.B basis, estimated insurance coverage charges upto the Institute premises should be indicated.
- 1.7 Price quoted shall also include CIF, New Delhi value both by Airfreight and Ocean freight.
- 1.8 In case of Foreign Quote, the mode of dispatch should be by Air Post Parcel/Ocean Freight/Air Freight (By Air India Freight) only. The approximate dimensions of the packages and weight of consignment are to be indicated.
- 1.9 In case of INR bids the price criteria should be on F.O.R.,BU, Bhopal. Govt. Levies like central excise duty, sales tax, octroi, WCT etc., if any, shall be paid at actual rates applicable on the date of delivery. Rates should be quoted accordingly giving the basic price, Central Excise Duty, VAT/ Central Sales Tax etc., if any. Please note that the University is exempted from payment of Excise duty vide Govt. Notification No..... -Central Excise dated
- 1.10 The University is exempted from payment of Custom and excise Duty as per the Government of India directives.
- 1.11 The actual Sales Tax Percentage (without Form "C") if any, should be specified.
- 1.13 Please provide TIN number of the firm along with the CST/WCT Number allotted by the concerned authorities in your quotation.

2. Bank Charges

All Bank charges inside India, including opening of LC, to the University Account and outside India to Beneficiary's Account only. In case the bidder seeks confirmation of LC such confirmation charges are to the Beneficiary's account. This may please be noted and confirmed.

3 Agency Commission & Services:

- 3.1 The Indian Agency commission payable in Indian currency only after the receipt of consignment in good condition at our Stores and satisfactory installation and commissioning of the ordered equipment.
- 3.2 In case of foreign quote, the Principal supplier should clearly indicate the address of the Indian Agent and percentage (%) of Agency Commission and taxes if any payable to him.

3.3 Details of services rendered by you as well as after-sales services offered by you are to be made clear in the tender.

3.4 High Sea Sale: For all High Sea Sale transactions:

- a. Offers shall be “on all inclusive basis” including delivery up to UIT premises at the risk and cost of the supplier. Customs Clearance is the responsibility of the supplier and at his cost and risk.
- b. 100% payment will be made within 30 days after receipt and acceptance of the items at our site. However, in exceptional cases based on merits of the case, 100% payment against delivery and satisfactory inspection at our site may be considered.
- c. Sales Tax is not applicable.
- d. Customs Duty Exemption Certificate and other relevant documents required for Customs clearance will be provided.
- e. High Sea Sales Agreement furnished by the supplier in accordance with the terms and conditions of our Purchase Order will be signed and issued by Registrar, Barkatullah University, Bhopal.

4 Delivery Schedule

4.1 The bidders may please note that the delivery of the system should be strictly within three months from the date of placement of firm order.

4.2 Goods should not be dispatched until the Vendor receives a firm order.

5 Security Deposit

The bidder will forfeit the 10% security deposit if he fails to execute the order as per the Purchase Order. This Security Deposit will be refunded to the vendor only on successful installation of the equipment at UIT, BU, Bhopal.

6 .Performance Bank Guarantee

The 10% Security Deposit which is mentioned above may be extended as Performance Bank Guarantee for a period of One Year or till the period of warranty if it is more than one year. This enables the bidder to get 100% L/C payment

7 Performance Benchmarks

The technical evaluation committee needs to be provided with an evaluation system to carry out performance benchmarks

8 Pre-installation:

The Bidder has to state in detail the Electrical Power/UPS requirements, floor Space, head room, foundation needed and also to state whether Air-conditioned environment is needed to house the system and to run the tests. i.e. pre-installation facilities required for installation may please be intimated in the technical bid. Subsequently, before the consignment lands in UIT, BU, Bhopal, the bidder shall confirm that the pre-installation requirements are sufficient for installation of the equipment. In other words the bidder should continuously monitor the pre-installation requirements and see that everything is ready before the consignment is taken to the site for installation.

9. Installation

- 9.1 Bidder shall be responsible for installation / demonstration wherever applicable and for after sales service during the warranty and thereafter.
- 9.2 Installation demonstration to be arranged by the supplier free of cost and the same is to be done within 15 days of the arrival of the equipment at site.

10 Warranty / Support

- 10.1 The items covered by the schedule of requirement shall carry minimum two years of comprehensive warranty from the date of acceptance of the equipment by the University. Warranty shall include free maintenance of the whole equipment supplied including free replacement of parts. The defects, if any, shall be attended to on immediate basis but in no case any defect should prolong for more than 24 hours. The comprehensive warranty includes onsite warranty with parts.
- 10.2 The defects, if any, during the guarantee/warranty period are to be rectified free of charge by arranging free replacement wherever necessary. This includes cost, insurance, freight, custom duty, octroi, local taxes if any should be borne by the beneficiary or his agent. A clear confirmation should be given for this item.
- 10.3 The warranty on the associated software should cover providing of upgraded version/s, if any, released during the warranty period free of cost.
- 10.4 The bidder shall assure the supply of spare parts after warranty is over for maintenance of the equipment supplied if and when required for a period of 10 years from the date of supply of equipment on payment on approved price list basis.
- 10.5 The equipment must be supported by a Service Centre manned by the principal vendor's technical support engineers. The support through this Centre must be available 24 hours in a day, seven days a week and 365 days a year.
- 10.6 An undertaking from the manufacturer is required in this regard stating that they would facilitate the bidder on regular basis with technology / product updates & extend support for the warranty as well.
- 10.7 The vendor will have to arrange for all the testing equipment & tools required for installation, testing & maintenance etc.
- 10.8 The principal vendor must have a local logistics support by maintaining a local spares depot in the country of deployment of the equipment. This is to ensure immediate delivery of spares parts from Principal Vendor of equipment to its channel partner/system integrator.
- 10.9 Details of onsite warranty, agency who shall maintain during warranty and undertake Annual Maintenance Contract/Comprehensive Service Maintenance Contract beyond warranty shall be given in the offer. In case of foreign quote, the Indian Agent who shall maintain during warranty and AMC beyond warranty shall be given in the Technical Offer.

11 Annual Maintenance Contract

- 11.1 The bidders should also quote for Annual Maintenance Contract after warranty for subsequent years. The AMC cost will be taken into account in deciding the lowest bidder.
- 11.2 No sub-contracting will be allowed for installation or maintaining system/ equipment / instrument during or after warranty period.
- 11.3 Mention the charges for comprehensive maintenance contract separately in Commercial bid (for post warranty period).

12 Indemnity:

The vendor shall indemnify, protect and save BU, Bhopal against all claims, losses, costs, damages, expenses, action suits and other proceeding, resulting from infringement of any law pertaining to patent, trademarks, copyrights etc. or such other statutory infringements in respect of all the equipments supplied by him.

13 Freight & Insurance as:

- 13.1 Imports : In case of imports the freight & insurance will be paid by University if the consignments are shipped through the University nominated freight forwarder.
- 13.2 Indigenous : The equipments to be supplied will be insured by the vendor against all risks of loss or damage from the date of shipment till such time it is delivered at UIT, BU, Bhopal site.

14 Payment

- 14.1 For Indigenous items, 90% payment shall be made against delivery, installation, commissioning and on acceptance as per Purchase Order at site and balance 10% shall be made after receipt of performance Bank Guarantee for 10% of the total order value, to be valid for One Year from date of installation and acceptance. If no Bank Guarantee is given, the balance 10% will be paid after assessing, after sales service during warranty period i.e. payment after warranty period.
- 14.2 For imported items, 90% payment shall be made by Sight Draft / an Irrevocable Letter of Credit established in favour of the supplier through the State Bank of India,, T T Nagar Branch, Bhopal for the order value, against the presentation of original Shipping documents. Balance 10% will be released after completion of satisfactory installation, commissioning, demonstration of the whole system, after imparting training and upon receipt of Bank Guarantee for 10% of total Order value towards performance security to be valid for one year from the date of installation. However Letter of Credit/Sight Draft arrangement will be made for 100% order value.
- 14.3 The payment of local currency portion shall be payable in equivalent Indian Rupees, within 30 days after the receipt of the equipment in good condition and after satisfactory installation and commissioning and demonstration.

15 Penalty for delayed Services / LD

- 15.1 As time is the essence of the contract, Delivery period mentioned in the Purchase Order should be strictly adhered to. Otherwise the University will forfeit EMD/SD and also LD clause will be applicable /enforced.
- 15.2 If the supplier fails to Supply, Install and Commission the system as per specifications mentioned in the order within the due date, the Supplier is liable to pay liquidated damages of 1% of order value per every week of delay subject to a maximum of 10% beyond the due date. Such money will be deducted from any amount due or which may become due to the supplier.
- 15.3 The University reserves the right to cancel the order in case the delay is more than 10 weeks. Penalties, if any, will be deducted from the Security Deposit.

16 Jurisdiction

The disputes, legal matters, court matters, if any, shall be subject to Bhopal Jurisdiction only.

17. Force Majeure

The University may consider relaxing the penalty and delivery requirements, as specified in this document, if and to the extent that the delay, in performance or other failure to perform its obligations under the Contract, is the result of a Force Majeure.

Force Majeure is defined as an event of effect that cannot reasonably be anticipated such as acts of God (like earthquakes, floods, storms etc.) acts of states, the direct and indirect consequences of wars (declared or undeclared) hostilities, national emergencies, civil commotion and strikes at successful Bidder's premises.

18. Arbitration

All disputes of any kind arising out of supply, commissioning, acceptance, warranty maintenance etc. shall be referred by either party (The University or the bidder) after issuance of 30 days notice in writing to the other party clearly mentioning the nature of dispute to a single arbitrator acceptable to both the parties. The venue for arbitration shall be BU, Bhopal, M P, India. The jurisdiction of the courts shall be Bhopal, M P, India.

Sd/-
REGISTRAR
Barkatullah University, Bhopal,
M P, India.

CHAPTER 4

SCHEDULE OF REQUIREMENTS, SPECIFICATIONS & ALLIED TECHNICAL DETAILS

APPLIED THERMODYNAMICS LABORATORY

S. No	Name of the Equipment	Qty.	Specification
1.	Steampower Plant	01	<ol style="list-style-type: none"> 1) Boiler- Non- IBR fully automatic, 600 Kg/hr. (approx), 10kg/cm² (approx), oil fired, four pass, vertical. 2) Separating and throttling calorimeter with condenser. 3) Steam turbine test rig – 3KW (approx), turbine coupled to 2 KW (approx) D.C. generator. 4) Turbine control panel with digital meters. 5) Shell and tube type surface condenser (steam to water) 6) Loading rheostat (resistance bank) 7) Water circulation pump – 2 H.P. (approx) 8) Condensate extraction pump – piston type – 0.5 H.P. (approx) 9) Steam flow meter – Orifice type. 10) Condensate collection cum measuring tank. 11) Fuel tank with stand, valves and piezometer. 12) Chimney – 30 feet height. (approx) 13) Steam pipe line, control valves, bends, with seamless pipes. 14) Insulation of steam line with Asbestos Rope 15) Solenoid steam valve. 16) Thermocouples, cables & interconnecting electrical connection. 17) Detailed instructional manual. 18) Erection, installation and demonstration of all equipment. <p>DESIGN FEATURES</p> <ol style="list-style-type: none"> 1) It should have Four pass, reverse flue gas path. 2) Steam production should be in about 5-10 min. 3) It should be exempted from Indian boiler regulations, 4) No qualified boiler attendant should be required. 5) It should have fully automatic burner control. 6) It should have occupies low floor area. 7) All standard indigenous parts should insure easy availability of spares in open market. 8) Economizer employed should supply preheated water to boiler. <p>SPECIFICATIONS</p> <ol style="list-style-type: none"> 1) Steam output : 600 Kg. (approximately) 2) Working pressure: 10-11 Kg/cm² (approx.) 3) Design Pressure: 17-18 Kg/cm² (approx.) 4) Hyd. Test pressure: 26-27 Kg/cm² (approx.) 5) Thermal efficiency: 90 ± 2% (approx.) (Based on NCV) 6) Fuel : LDO 7) Fuel consumption: about 33 Kg/hr. 8) Burner control: on/off. 9) Power supply: 3-ph, 415V, AC, 50Hz, 4 wires with neutral. 10) Connected load: 3.0 KW. (approx.)

			<p>ACCESSORIES</p> <ol style="list-style-type: none"> 1) Air blower: 1.5 KW capacity (approx.) 2) Water pump : Aspect, high head, triplex pump 0.75 KW (approx.) (feed water) 3) Fuel pump: With fitters, valves 0.37 KW (approx.) 4) Pressure control: Through HPLP cutout, solenoids, pressure switches. <p>MOUNTINGS</p> <ol style="list-style-type: none"> 1) Safety valves: Gun metal / bronze body – 1 No. 2) Steam stop valve: 1” (approx.) gun metal/bronze body – 1No. 3) Blow down valve: ¾” gun metal/bronze body – 1No. 4) Pressure measurement: At all appropriate places. <p>ELECTRICAL PANEL</p> <p>All contactors relays Digital temperature controller Heater Press button switches. Pressure switches.</p> <p>INSULATION</p> <p>Asbestos Rope</p> <p>FINISH</p> <p>Red oxide primer and one coat of enamel paint.</p> <p>BASE</p> <p>Strong channel base, houses all parts of boiler.</p> <p>SOFTENER</p> <p>A softener should be provided with the system. However resin should be supplied at the time of installation with all control valves, back wash facility, regeneration facility etc.</p> <p>CHIMNEY</p> <p>Flanged ends, 30 feet (approx) chimney provided with thermo well. Instructions Manual: 04 Nos.</p>
2	Centrifugal Air Compressor Test Rig	01	<ol style="list-style-type: none"> 1. One experimental type centrifugal air compressor suitable for a pressure of 0.5Kg/cm² – 0.75Kg/cm² (approx.) driven by squirrel induction motor about 5HP the motor is provided with suitable starter. Motor from standard make 2. An orifice type air intake measuring device with orifice plate & U-tube manometer, M.S. air intake reservoir of size 0.3× 0.3×0.5m (approx.) mounted on sturdy stand. 3. Energy meter, starter & stop clock should be provided. 4. The equipment should be complete with the following standard accessories: <ol style="list-style-type: none"> i Pressure Gauge : 1No. ii Non Return valve: 1No. 5. Other necessary accessories 6. Inspection & Training for 2 personals at works.

HEAT & MASS TRANSFER LABORATORY

S. No	Name of the Equipment	Qty.	Specification
3	Shell And Tube Heat Exchanger	01	<ol style="list-style-type: none"> 1. Shell Details: Two pass provided with end boxes Material: Mild Steel. Inner Diameter: 210-220mm (approx.) Thickness: 6 mm (approx) Length: 500-600mm (approx.) Baffles : Equidistant 25% cut along the length, 4 Nos. cold and hot fluid inlet and outlet connections. 2. Tube Details: Material : Copper Outer Diameter: 9-11mm (approx.) No. of tubes: 32 (approx.) 3. Geysers: 3 KW capacity (approx), 2 Nos. 4. Measuring tank and stopcock, for water flow measurement of hot and cold water 5. Thermometers to measure the inlet and outlet temperature of hot and cold water. 6. Control panel comprising digital voltmeter and digital ammeter. 7. Instruction manuals: 4 Nos.
4	Heat Transfer In Natural Convection Apparatus	01	<ol style="list-style-type: none"> 1. Vertical cylinder fitted in a large enclosure with top and bottom open to ensure undisturbed natural convection. Perspex sheet should be provided at the front side of enclosure for visual display. 2. Enclosure size – 20cm X 20cmX60cm long (approx.) 3. Tube size (Test cylinder): 38mm (approx.) outer diameter, 50cm length (approx.) Brass pipe. 4. Heater – Nichrome heater 300-400 (approx.) watt. 5. Control panel comprising <ol style="list-style-type: none"> (i) Digital voltmeter (ii) Digital Ammeter (iii) Dimmer stat (iv) Multichannel digital temperature indicator 0-300^o C, 0.1^o C least count. 6. Thermocouples – Chromel Alumel Nos. 8 (approx.) and other necessary accessories. 7. Instructions Manual: 04 Nos.
5	Heat Transfer In Forced Convection Apparatus	01	<ol style="list-style-type: none"> 1. The unit should consist mainly a centrifugal blower, electrically heated test section, control valve to regulate the air flow and an orifice meter and U-tube manometer for flow measurement. 2. Diameter of test section – 34—36mm (approx.) 3. Length of the test section – 400mm (approx.) 4. Orifice meter – 14mm (approx.)

			<ol style="list-style-type: none"> 5. No. of thermocouples on pipe surface – 6 6. No. of thermocouples for air temperature – 3 7. Nichrome heater of suitable capacity – 300-400 watts. (approx.) 8. Blower 0.5 HP (approx.) capacity with motor. 9. Control panel comprising. <ol style="list-style-type: none"> (i) Digital voltmeter (ii) Digital Ammeter (iii) Dimmerstat (iv) Multi channel digital temperature indicator 0-300°C, 0.1°C (approx.) least count. 10. Chromel Alumel thermocouples and other necessary accessories . 11. Instructions Manual: 04 Nos.
6	Stefan Boltzmann Apparatus	01	<ol style="list-style-type: none"> 1. Hemisphere diameter: 200mm (approx.) made of copper sheet. 2. Water jacket diameter: 250mm (approx.) 3. Test Disc made of copper 4. Diameter of test disc – 20mm (approx.) 5. Thickness of test disc – 2mm (approx.) 6. No. of thermocouples on hemisphere – 4 7. Water tank of approx. 8 litre capacity with a approx. 1.5KW immersion heater. 8. Base plate – Bakelite 25cm (Approx.) 9. No. of thermocouples on test disc – 1 10. Stop clock. 11. Control panel comprising <ol style="list-style-type: none"> (i) Digital voltmeter (ii) Digital Ammeter (iii) Multipoint digital temperature indicator 0-300°C, 0.1°C least count using Chromel – Alumel thermocouples built – in-timer for temperature readings at 5 seconds interval and other necessary accessories. <p style="text-align: center;">. Instructions Manual: 04 Nos.</p>
7	Heat Transfer Through Composite Wall Apparatus	01	<ol style="list-style-type: none"> 1. Slab Size <ol style="list-style-type: none"> (i) Diameter of slabs: Mild Steel – 300mm (approx.) Wood – 300mm (approx.) Bakelite – 300mm (approx.) (ii) Thickness of slabs: Approximately 10-12mm each. 2. Nichrome heater of suitable capacity wound on mica & sandwiched between aluminum 3. Control panel comprising. <ol style="list-style-type: none"> (i) Digital voltmeter (ii) Digital Ammeter (iii) Dimmerstat (iv) Multipoint digital temperature indicator 0-300°C, 0.1°C least count using Chromel Alumel

			<p>thermocouples.</p> <ol style="list-style-type: none"> 4. Wooden cabinet of suitable size to accommodate the slab assembly with screw press and other necessary accessories. 5. Instructions Manual: 04 Nos.
8	Heat Transfer Through Lagged Pipe Apparatus	01	<ol style="list-style-type: none"> 1. Pipe Details: G.I. Pipe inside – 5cm dia approx. G.I. pipe middle – 10cm dia approx. G.I. Pipe outer – 15cm dia approx. (ii) Length of pipes – 1m approx. 2. Length of pipes: 1m approx. 3. Lagging: Plaster of paris powder filled between inner and middle pipes. saw dust filled between outer and middle pipes 4. Control Panel comprising: Digital voltmeter: 0-230V. Digital ammeter: 0-2AMP, Dimmerstat for heater: 0-230V, 2 Amp Multi point Digital. Temperature indicator: 0-300C, 0.1^oC least count, using Chromel Alumel thermocouples Nichrome cartiage heater of suitable capacity and length at the axis of pipes and other necessary accessories, 5. Instruction manual 4 copy.
9	Parallel Flow/ Counter Flow Apparatus	01	<ol style="list-style-type: none"> 1. The unit should consist of a tube in tube type concentric tube type heat exchanger. Hot fluid should flow through inner tube and cooling water should flow through annulus. 2. Heat Exchanger. (i) Length of heat exchanger 1-1.5m (approx.) Outer tube Material – G.I. Inner diameter – 25-27mm (approx.) Outer diameter – 31-34mm (approx.) (iii) Inner tube Material – copper Outer diameter 12.5-13mm (approx.) 3. Thermometer: 0-50^oC, 2 Nos. 10 – 100^oC, 2 Nos. 4. Geyser – Approx. 3 KW capacity. 5. Measuring flask with stop clock 6. Valve arrangement for parallel flow/counter flow operation and flow control and other necessary accessories.
10	Heat Transfer From A Pin Fin Apparatus	01	<p>Fin OD 12mm (approx.) Length 15cm (approx) one each of Mild steel , Aluminum and Brass. Air Flow Duct size 15cm × 10cm × 100cm(approx.) connected at suction of blower with bell mouth entry. Centrifugal Blower: 230V, 1H.P. single phase Motor</p>

			<p>Heater Nichrome wire type band heater of suitable capacity Control Panel comprising: Digital Voltmeter: 0- 300V. Digital ammeter: 0 – 5AMP, Dimmerstat for heater: 0 - 230 V, 5amp, Multi point Digital Temperature indicator: 0-300⁰C, 0.1⁰C least count, using Chromel Alumel Thermocouples Orifice meter on blower outlet with water manometer and other necessary accessories. Instruction manual 4 copy</p>
11	Thermal conductivity of metal rod.	01	<p>Metal Bar Details Bar Material: Copper Diameter 25mm (approx.), Length 430-500mm(approx.) Insulating powder shell: 200mm dia (approx.) Cooling water chamber: 100mm dia (approx.) Length 75mm (approx.) Nichrome Heater 1000 watts. (approx.) Control Panel comprising: Digital voltmeter: 0300V. Digital ammeter: 0-5AMP. Diamerstat: 0-230V, 5Amp. Multi point digital temperature indicator Range: 0-300⁰C with 0.1⁰C accuracy with Chromel Alumel thermocouples. Stop clock and measuring flask of capacity 100ml. (approx.) and other necessary accessories. Instruction manual 4 copy.</p>
12	Film wise and drop wise condensation Apparatus	01	<ol style="list-style-type: none"> 1. Steam generator: 8-10 litre (approx.) capacity with 1.5 - 2KW (approx.) capacity water heater and heater control and pressure relief valve, steam dryer 2. Condenser: 20-25 mm (approx.) O.D., 150mm (approx.) long chrome plated – 1 no. (for condensation in drop forms) 20 -25 mm (approx.) O.D., 150mm (approx.) long natural finish – 1no. (for condensation film forms) 3. Pressure gauges- 0 – 2.5Kg/cm² (approx.) 4. Rota meter –20 –300 (approx.) litre/hr. for cooling water flow measurement . 5. Multi – channel digital temperature indicator 6. Set of thermocouples. 7. Condensate measuring cylinder with stop watch. 8. Flow control valves for cooling water, steam control and drain And other necessary accessories. 9. Instruction manual 4 copy

I.C. ENGINES LABORATORY

S. No	Name Of the Equipment	Qty.	Specification
13	Four Stroke Single Cylinder Petrol Engine Test Rig	01	<ol style="list-style-type: none"> 1. The test rig should comprise of air cooled petrol engine provided with rope brake dynamometer. Rope brake is water cooled. Temperatures are measured by a digital temperature indicator. Various measurements provided enable to determine B.H.P., fuel and air intake, brake thermal efficiency at various loads. 2. Engine: Air cooled petrol engine developing 3 H.P. (approx.) at 3000 RPM 3. Rope brake:- Dia. 260mm (approx), coupled to engine with rope wound around the drum. Spring balance & dead weights for loading the engine, Water cooling arrangement for the drum.. 4. Air intake measurement:- Intake tank of 250X250X250 mm (approx.) fitted with orifice and water manometer. 5. Fuel intake measurement:- Calibrated burette with three way cock assembly for cutting off the fuel supply from the tank. 6. Exhaust gas calorimeter:- Water cooled exhaust gas calorimeter, shell and coil type of study the heat lost to exhaust gases. Multichannel digital temperature indicator for measuring inlet & outlet temperatures of exhaust gases and water. 7. Tachometer, 0-9999 rpm, contact type. 8. Inspection & training for two personals at works. 9. Instruction Manual: 04 Nos
14	Computer Based Four Cylinder Four Stroke Petrol Engine With Hi Speed Data Acquisition System	01	<ol style="list-style-type: none"> 1. Engine: Four cylinder 4 stroke petrol engine of 1000cc(approx.) MPFI Developing about 50HP at 2000- 2500rpm, Standard make 2. Dynamometer: The engine is coupled to eddy current Dynamometer of 50 – 70HP (approx.)capacity at 1500rpm (standard make) 3. Torque measurement: With load cell, output 4 – 20mA 4. P - θ & P – V Plot <ol style="list-style-type: none"> (i) Peizo sensor : 1no for combustion pressure (ii) Spark sensor : 1no (iii) Piezo charge amplifier : 1 no (iv) Crank angle sensor with TDC marker : 1 no (v) Temp. transmitter : 6 No. with sensor (vi) ADC card: 1no. with complete inter facing 5. Software : A powerful software with DAS to analyze engine performance and heat balance 6. Computer Intel core duo 2 GB RAM, Multimedia keyboard & color monitor, 160GB hard disk of Standard make 7. Fuel measuring device: Burette for fuel quantity measurement. Fuel tank mounted on sturdy iron stand, burette tube, three way cock connecting tube & a Stop clock.

			<p>8. Calorimeter: Shell & tube Heat exchanger to measure the heat going through exhaust gases.</p> <p>9. Air intake measurement(shown on computer) - by Air box Method</p> <p>10. Gauges for oil pressure and Digital temperature measurement.</p> <p>11. Anti vibration mount and other necessary accessories required to conduct exp. Instruction Manual 4 copies.</p> <p>12. Inspection by expert & Training for 2 personals at works.</p> <p>The test rig enables to determine IP, BP, specific fuel consumption, Air fuel ratio, volumetric efficiency, Heat balance sheet at different loads and speeds. Ignition advance & retard facility, also Morse test facility & P - Θ & P - V curves.</p> <p>All the results should be displayed on the PC along with the engine performance shown graphically</p>
15	Variable Compression Ratio Engine Test Rig with Hi Speed Data Acquisition system(DAS)	01	<p>1. Engine: Single cylinder 4 stroke Air cooled/ water cooled with variable compression ratio range 5:1 to 20:1 (Approx) Engine test rig developing about 3 – 5 HP at 1500- 2000rpm (Standard make)</p> <p>2. Dynamometer: The engine is coupled to eddy current dynamometer capacity of (about) 5HP at 2000rpm control panel provided with dynamometer (standard make)</p> <p>3. Fuel measuring device: Fuel tank mounted on sturdy iron stand, burette tube three way cock connecting tube & stop clock</p> <p>4. Fuel pump and fuel injector for diesel operation.</p> <p>5 Colorimeter: Shell & Tube heat exchanger to measure the heat going through exhaust gases.</p> <p>6. Air intake Measurement (shown on computer) - by Air box Method</p> <p>7. 12 channel digital temperature indicator: with set thermocouples (six) along with six way selector switch</p> <p>8. Ignition timing varying arrangement from 28^o BTDC to 10^o ATDC</p> <p>9. Anti vibration mount and other necessary accessories required to conduct exp. Instruction Manual 4 copy.</p> <p>10. Inspection by expert & Training for 2 personals at works.</p> <p>11. Software : A powerful software with DAS to analyze engine performance and heat balance</p> <p>12. Computer Intel core duo 2 GB RAM, Multimedia keyboard & color monitor, 160GB hard disk of Standard make</p> <p>The test rig enables to determine IP, BP, specific fuel consumption, Air fuel ratio, volumetric efficiency, Heat balance sheet at different loads and speeds & P - Θ & P - V curves.</p>

			All the results should be displayed on the PC along with the engine performance shown graphically
16	Computer Based Single Cylinder (Vertical) Diesel Engine Test Rig with Hi Speed Data Acquisition System	01	<ol style="list-style-type: none"> 1. Engine: Single cylinder four stroke diesel engine of about 5 HP capacity Make : Standard make 2. Dynamometer: The engine is coupled to eddy current dynamometer of about 7.5 HP capacity 1500RPM 3. Torque measurement: with load cell output : 4 – 20 mA 4. P - Θ & P – V plot <ol style="list-style-type: none"> (i) Peizo sensor : 1no for combustion pressure (ii) fuel injector sensor : 1no for fuel injection timing (iii) Piezo amplifier : 1 no for amplifying the signal (iv) Crank angle sensor with TDC marker : 1 no (v) Temp. transmitter : 6 No. with sensor (vi) ADC card : 1 No. with complete inter facing 5. Software : A powerful software with DAS to analyze engine performance and heat balance 6. Computer Intel core duo 2 GB RAM, Multimedia keyboard & color monitor, 160GB hard disk of Standard make licensed version of operating system on completion of test, various results, formats & graphical representation shall be viewable on soft copy on screen as well as on hard copy printout 7. Colorimeter: Shell & Tube heat exchanger to measure the heat going through exhaust gases.(with 12 channel digital temperature indicator) 8. fuel measuring device: Burette for fuel quantity measurement. Fuel tank mounted on sturdy iron stand, burette tube, three way cock connecting tube & a Stop clock 9. Air intake Measurement (shown on computer) - by Air box Method 10. Anti vibration mount and other necessary accessories required to conduct exp. Instruction Manual 4 copy. 11. Inspection by expert & Training for 2 personals at works. The test rig enables to determine IP, BP,specific fuel consumption, Air fuel ratio, volumetric efficiency, Heat balance sheet at different load and speeds. P - Θ & P – V curves All the results should be displayed on the PC along with the engine performance shown graphically
17	Smoke Meter	01	<p>Compliance Standard: MoRTH Specification Other Standard: ECE – R24 and ISO 3173 Approval: A.R.A.I. Pune Result compatibility: Measurement result should be fully compatible with Hartidge Smoke Units (HSU). Range/Accuracy/Resolution</p>

		<p>Measuring Range: OPACITY 0 – 100% (approx.) ABSORPTION: 0 -99.99 m⁻¹ (approx.) Accuracy & Repeatability: OPACITY ± 1.5 (approx.) Of full scale ABSORPTION: Better than ± 01 m⁻¹ (approx.) Resolution: OPACITY 0.15% (approx.) ABSORPTION: 0.01 m⁻¹ (approx.) Application: Steady speed and Free- acceleration test Calibration: Automatic(Self -calibration immediately after switch –on or at the press of a key) Display: Digital Standard: LED(7 segment), 4× 15(mm) (approx.) Alarming Signal: Equipment is not working Voltage: LED lights up when Battery supply is less than 11.5 V or Defective Voltage supply, to equipment’s integral supply unit. Pressure: LED lights up when measurement chamber pressure deviates from ambient air pressure by ± 75 mm (approx.) of water (750pa). Temperature: LED lights up when Temperature of measuring chamber is below 70⁰C (approx.) Linearity check: 45% - 55% (approx.) Standard: Automatic Probes: Probes for different exhaust size Hose Pipes: With suitable hose pipes to with stand high temperature Smoke temperature at entrance: up to 300⁰C Computer Interfacing: Data communication to a Computer or Terminal or other Compatible devices is possible through built-in SERIAL IN/OUT SOCKET. (RS-232 Interface) for data communication to Computer. Software: Ver 6.05(Used for Impact Printer) Meets the requirement of MoRTH specification i) Bandwidth of 0.25 m⁻¹ (approx.) or 25% (approx.) for free acceleration ii) Real time check feature in print out.</p>
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FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

S. No	Name of the Equipment	Qty.	Specification
18	Orifice Meter Apparatus	01	<p>Description: The unit consist of supply tank 50-60 Litr. (approx.) along with orifice and mouthpiece fixed to the tank. A Pointer is provided at the discharge of orifice to demonstrate and to determine X,Y , Co-ordinate of jet.</p> <p>Features:</p> <ol style="list-style-type: none"> 1. An arrangement to obtain a steady or quiescent flow. 2. An arrangement to vary the head by changing the position of over flow pipe. 3. Standard Piezo-meter tube to measure head. 4. An arrangement to measure co-ordinate of jet. <p>Range of experiment: Determination of coefficient of discharged (C_d) and coefficient of velocity (C_v) and coefficient of contraction (C_c) for orifice.</p> <p>Specification :</p> <ol style="list-style-type: none"> 1. main supply tank 50-60 Litr. (approx.) (Standard make) with orifice No.2 (Standard material) of circular diameter 10-15mm (approx.) and another of circular diameter 10-15mm (approx.) and mouthpiece fitting arrangement. 2. Measuring tank capacity 25-30 Ltr. (approx.) for flow measurement 3. Orifice meter material clear acrylic compatible to 1" diameter pipe. (standard make) 4. Tracer pointer with scale.(Standard make) 5. Electronic stop clock. Standard make) 6. Pump set 0.5 hp. to 1.5 hp.(approx.) (Standard make) 7. Control panel with on/off switch and main indicator, etc. <p>Inspection & training for two personals at works.</p> <ol style="list-style-type: none"> 9. Instruction Manual: 04 Nos
19	Flow Measurement by Venturi Meter and Orifice Meter Recirculation type	01	<p>Description : The unit consist of two pipe emerging out from common manifold along with an venturi meter & orifice meter, tapping are provided to measure pressure differences which are connected to differential manometer. A flow regulating valve is provided at the down speed stream of pipe. A measuring tank is provided to collect the flow. The actual flow rate can be measure are both meters calibrated.</p> <p>Features:</p> <ol style="list-style-type: none"> A) Two pipes emerging out from a common manifold with a orifice meter. B) Each line is provided with flow control valve for setting of differential flow rates. C) Pressure of different pipe lines are connected. D) Flow control valve at the end of each line assures for full running of pipe. <p>Range of experiments:</p> <ol style="list-style-type: none"> 1) Calibration of venture meter. 2) Calibration of orifice meter.

			<p>Specifications: Measuring tank (60-65 Ltrs.) (approx.) & electronic stop clock. Basic piping 0.75" – 1" (approx.) (Standard make) Orifice meter 0.75" – 1" (approx.) (Standard make) & venture meter. 0.75" – 1" (approx.) (Standard make) Differential manometer. (approx.) (Standard make) Flow control valve . (Standard make) Control panel with on off switch, main indicator Inspection & training for two personals at works. Instruction Manual: 04 Nos</p>
20	Verification Of Bernoulli's Theorem Apparatus Recirculation Type	01	<p>Description : The unit consists of a rectangular transparent flow section through which water is to be flown the velocity of water is-changes as cross sectional area of channel changes. The changes of head can be measured with manometric tube connected at various sockets, along with the length of channel. Thus the Bernoulli's theorem can be verified by calculating the energy & head of water at different section.</p> <p>Features:</p> <ol style="list-style-type: none"> Steady flow arrangement. Transparent flow section. Independent measurement of pressure head. Variable flow rate arrangement. Self sufficient unit. <p>Range of experiments: Bernoulli's theorem can be verified</p> <p>Specification :</p> <ol style="list-style-type: none"> Flow channel 60-65 cms. (approx.) long, transparent acrylic. (size 1" dia meter.) (approx.) Supply with flow control valve. Mano metric tubes fixed over the flow channel. Measuring tank. 25-30 liter. (approx.) material stainless steel fitted with piezometer tube & scale. Inlet tank 20-25liter. (approx.) make up stainless steel., supply tank 50-55 liter. (approx.) makeup of stainless steel. Sump tank . (50 – 60 Liter.) (approx.): is fitted on heavy stand. Inlet tank: capacity (20-25Liter.) (approx.) Measuring tank: 25-30 Liter.) (approx.) (SS Standard make) with piezometer tube and scale. ½ - 1 hp. standard pump for recirculation type unit. Stop clock. (electronics standard type) Inspection & training for two personals at works. Instruction Manual: 04 Nos
21	Flow Through Mouth Piece And Orifice Instrument Recirculation Type	01	<p>Description: The unit consist of supply tank along with orifice and mouthpiece fixed to the tank. A Pointer is provided at the discharge of orifice to demonstrate and to determine X,Y , Co-ordinate of jet.</p> <p>Features:</p> <ol style="list-style-type: none"> An arrangement to obtain a steady or quiescent flow. An arrangement to vary the head by changing the position of

			<p>over flow pipe.</p> <p>7. Piezometer tube to measure head.</p> <p>8. An arrangement to measure co-ordinate of jet.</p> <p>Range of experiment: Determination of coefficient of discharged (C_d) and coefficient of velocity (C_v) and coefficient of contraction (C_c) for orifice.</p> <p>Specification :</p> <p>10. Stainless steel main supply tank (50- 60 Litr.) (approx.) constant level tank capacity (25 – 30 Litr.) (approx.) Stainless steel measuring tank (25 – 30 Litr.) (approx.) Stainless steel make fitted with piezo-meter tube and scale.</p> <p>11. orifice set of two, acrylic material diameter 10mm – 15mm and mouthpiece set of 2-3 acrylic material diameter 10mm – 15mm (approx.) with L/D = 1, 2.5, & 4) fitting arrangement.</p> <p>12. Tracer pointer with scale. (Standard make)</p> <p>13. Measuring tank and electronics stop clock.</p> <p>14. Piping GI/PVC (approx.) (Standard make)</p> <p>15. Inspection & training for two personals at works.</p> <p>16. Instruction Manual: 04 Nos</p>
22	Reynolds Apparatus (Recirculation Type)	01	<p>Description : The unit consists of a Acrylic tube connected to a tank. At entrance of tube a bell mouth section is provided and at the other end a valve is provide to control the rate of flow. A capillary tube is introduced centrally to the bell mouth to inject die. By varying the rate of flow the Reynolds number changes. This also changes type of flow. Visual observation of die (thread) will indicate the type of flow which can be confirmed from the REYNOLDS number computed.</p> <p>Features:</p> <ol style="list-style-type: none"> Steady flow arrangement Very clear flow visualization Fine control of die thread. Accurate flow measurement & control. <p>Range of experiments:</p> <ol style="list-style-type: none"> To determine the Reynolds number & hence the type of flow either laminar or turbulent. To determine upper & lower Reynolds number & velocities. <p>Specifications:</p> <ol style="list-style-type: none"> Acrylic or borosilicate glass tube (transparent) 25- 30 mm (approx.) OD (approx.) of suitable length. Dye vessel material stainless steel, suitable capacity. Capillary tube material copper/stainless steel Sump tank (stainless steel material) of 1125X410X410 mm (approx.) (50-60 Litr.) (approx.) Supply tank (stainless steel material) of 400X400X400 mm (approx.) 25-30 litr. (approx.) size & die tank with die needle and constant head water tank capacity 25-30 litr. (approx.) Water circulation pump 0.5 hp. – 0.75 h.p. (standard make) Suitable standard motor for recirculation type

			<p>unit.</p> <p>7. Flow control valve.</p> <p>8. Measuring Flask & electronics stop clock for flow measurement.</p> <p>9. Control panel with on/off switch, main indicator etc.</p> <p>10. Inspection & training for two personals at works.</p> <p>11. Instruction Manual: 04 Nos</p>
23	Pelton Wheel Turbine Test Rig. {5 h. P.} (Closed-Circuit)	01	<p>Description</p> <p>The unit consists of a small pelton wheel connected to rope brake dynamometer. It is high head at minimum discharge turbine. Water is given from reservoir to the turbine through penstock. A centrifugal pump is provided to supply the water to turbine. Orifice meter & pressure gauges provided to measure flow rate, water jet is directed over the bucket by a nozzle Thus, and we can determine B.H.P. & I.H.P. & various efficiencies.</p> <p>Specifications :</p> <ol style="list-style-type: none"> 1. Pelton Wheel impulse type rated rpm 1000-1500 rpm (approx.): discharge capacity 400-800 litres./min (approx.): supply head 50-60mtrs (approx.) (capacity 4 – 5 h.p.): Fitted with 18 buckets (standard material i.e. gun metal), nozzle for water jet, casing with one side of Perspex sheet. 2. Suitable pump 3”X2.5” : discharge 750-800 liter./Min. (approx.) to supply pressurized water to the turbine at the head of 35 m – 55 m. (approx) capacities. Motor capacity” 15HP, starter for the motor of standard make. 3. Orifice meter/venturi meter to measure water flow rate. 4. Pressure gauge (standard make) to measure head; double column: differential manometer (manometer fluid : mercury 5. Loading: material: Rope brake: arrangement (drum size 300-350mm diameter (approx.)standard material i.e. cast iron with spring balances.(standard make) 6. Sump tank 50-100 liter. (approx.) provided with sump & turbine mounting arrangement. (standard make) 7. Necessary piping valves, gauges, Rota meter etc. (standard make) 8. Front acrylic cover for visualization of turbine operation. (standard make) 9. R.P.M. indicator digital type 10. Inspection & training for two personals at works. 11. Instruction Manual: 04 Nos <p>Range of experiment:</p> <ol style="list-style-type: none"> 1. To demonstrate operation of pelton turbine. 2. To study performance characteristics of pelton turbine. 3. To study effect of discharge & velocity of impinging water on turbine.
24	Francis Turbine test rig (5 hp)	01	<p>Specifications:</p> <ol style="list-style-type: none"> 1. Francis turbine: (invert flow reaction turbine) capacity (4-5 hp.): Rated speed: 1250-1300 R.P.M.: Discharge capacity: 1950 - 2050 Liter./min. (approx.): Supply head 25-30mtr. (approx.) 95mm -105mm size to develop 3.5 – 4KW (approx.) complete with rope brake arrangement standard material i.e. cast iron: drum size 300mm diameter (approx.) pressure and vacuum gauges, dead

			<p>weights etc.,(all are of standard make) for conducting experiment in metric units.</p> <ol style="list-style-type: none"> 2. 15 HP supply pump set (size 4”X4” (approx.): discharge 1800 liter./min. (approx.): total head 30mtrs. (approx.) suitable for supplying water to the above turbine and for operation on 400 volts 3 phase 50 cycles AC mains: Starter for the motor. 3. Switch & starter suitable for the above mono-block pump set, mounted on the panel board. (standard make) 4. RPM indicator of digital type ((standard make) 5. Flow measuring unit, consisting of a suitable venturi meter/orifice meter and manometer (manometric fluid mercury) pressure gauge and vacuum gauge (standard make) 6. Piping system consisting of pipes (material stainless steel) valves fitting complete with suitable for the test rig. (standard make) 7. Fiber glass lined (S.S. Material) Sump to store sufficient water for independent circulation through the unit for experimentation and arranged within the floor space of the main unit. (standard make) 8. Rigid (S.S./Standard Material) frame work capacity fitted with all the above items as a self sufficient package unit, Suitable for operation without any foundation. (standard make) 9. Inspection & training for two personals at works. 10. Instruction Manual: 04 Nos
25	Kaplan Turbine Test Rig (5 h.p.) Close Circuit	01	<p>Specification :</p> <ol style="list-style-type: none"> 1) Kaplan turbine: Axial flow reaction turbine designed (runner bladders operational gun metal/standard material to develop 3.5 kw.- 4 KW (approx.) at 1500-2000 R.P.M., with a flow of 4500-7000 lpm (approx) 6-8 meter head guide vanes 14 Nos. operational runner bladders operational (gun metal) (approx.) complete with rope brake arrangement (drum size 200-250mm. diameter (approx.) pressure head measuring device, two circular balances, for conducting experiments in Metric units. 2) Supply pump (Mono block 6”X6”) set suitable for the above consisting of a pump of size 250-300mm to discharge 5000-7000 LPM (approx.) at 8-10 meter total head coupled with a 15-20 h.p motor suitable for operation on 3 phase 50 cycles, 400 V., A.C. supply. 3) Main switch, Manual Star Delta Starter for the pump set mounted on a panel board (all are of standard make). 4) Flow measuring unit, consisting of 200-300mm Orifice meter/venturi-meter and double column differential

			<p>manometer with stand (with mercury).</p> <p>5) Piping system consisting of pipes (S.S. material) valves, fittings, complete with Suitable for the test rig. (all are of standard make)</p> <p>6) Fiber glass lined with recirculation piping system with stainless steel sump tank.</p> <p>7) Rigid (standard make) frame work, compactly fitted with all the above items as a self sufficient package unit, suitable for operation</p> <p>8) RPM Indicator digital type:</p> <p>9) Inspection & training for two personals at works.</p> <p>10. Instruction Manual: 04 Nos</p>
26	Reciprocating Pump test rig. (Recirculation type) (D. C. Motor variable speed)	01	<p>Description : The consists of reciprocating pump mounted over the sump tank, the unit is self contained, recirculation type provided with vacuum gauge at suction & pressure gauge at discharge. Input to motor & output of pump can be measured and pump performance can be estimated at different speeds by means of and at different heads.</p> <p>Specification:</p> <ol style="list-style-type: none"> 1. Reciprocating pump:-3/4" x 3/4" size provided with 1-2 H.P. D. C. Motor & speed Controller (all are of standard make). 2. Sump tank (stainless steel material) 3. Measuring tank. (stainless steel material) 4. Energy meter (digital type) for motor input measurement. 5. Pressure & vacuum gauge for measurement of head. (standard make) 6. Digital stop clock. 7. Inspection & training for two personals at works. <p>8. Instruction Manual: 04 Nos</p> <p>Range of Experiments: Following characteristics can be studied at different speeds</p> <ol style="list-style-type: none"> 1) Discharge Vs Head. 2) Discharge Vs Input of pump. 3) Discharge Vs Pump efficiency.
27	Single Stage Centrifugal Pump Test Rig (3 h.p.) (recirculation type)	01	<p>Description : The unit consists of a centrifugal pump provided with a vacuum gauge at suction and a pressure gauge on discharge pipe. The pump is provided with a constant speed drive & gate valve at discharge which facilitates estimation of pump performance. Power input to motor is measure with energy meter.</p> <p>Specification :</p> <ol style="list-style-type: none"> 1) Centrifugal pump with D.C. motor. (of standard make) 2) Sump tank (stainless steel material) :- suitable size

		Following	<p>3) Measuring Tank (stainless steel material) : - suitable size</p> <p>4) Energy meter (digital type) for motor input measurement.</p> <p>5) Pressure & vacuum gauge for measurement of head. (all are of standard make)</p> <p>6) Digital stop clock</p> <p>7) The assembly of pump & control are mounted on the sump tank.</p> <p>8) Inspection & training for two personals at works.</p> <p>9) Instruction Manual: 04 Nos</p> <p>Range of Experiments:- characteristics can be studied at different speeds</p> <ol style="list-style-type: none"> 1. Discharge v/s Head 2. Discharge v/s Input to pump <p>Discharge v/s pump efficiency</p>
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Materials Science and Nanotechnology Laboratory

S. No.	Name Of the Equipment	Qty.	Specification
28	Scanning Probe Microscope	01	<p>The imaging system (for measurements on thin films, dielectrics) consisting of a Scanning Probe Microscope (SPM) capable of Multiple Mode Imaging Techniques. The instrument should be able to scan dimensions ranging from about few microns to a few nanometers with extreme linearity. The following minimum instrument specifications are required including installation:</p> <p>(1) SPM Unit</p> <p>Measuring Mode : Contact Mode AFM/LFM, Dynamic/tapping mode AFM , Phase & Magnetic Force (MFM), EFM. STM is a must.</p> <p>The system should be a one which is upgradeable to other options (Nano-Indent and Nano-litho software.C-AFM and Piezo force / piezo response microscope HT option etc) at site at a later stage.</p> <p>Resolution: Horizontal/Vertical: Typically 0.01 nm</p> <p>AFM head</p> <p>Displacement detection system: Light source / Optical lever / Detector Light source : Laser diode (650nm, 1mWmax, On / Off possible) Detector: Photo detector</p> <p>Scanner</p> <p>Drive element: Tube piezo element 10 μm x10 μm close loop scanner with a guaranteed atomic resolution optional 80 to 120 μm closed loop scanner, but with a guaranteed atomic resolution should be quoted separately.</p> <p>Stage</p> <p>Max. sample loading size : 24 mm × 8mm Sample replacement method : Head slide mechanism Sample securing method : Magnet AFM head drive range : 6 mm × 6 mm</p>

			<p>Z-axis coarse adjustment mechanism Method : Completely automated adjustment by stepping motor system Max. stroke : 10mm Min. step width: 21.4nm</p> <p>Signal display panel Display volume: Full luminescence (digital display)</p> <p>Beam splitter slide mechanism Included in the SPM Unit Position of the beam splitter: Two positions (SPM observation / Optical microscope observation)</p> <p>Vibration isolation system: Should be included in the SPM Unit</p> <p>(2) Control Unit Scan controller X/Y axis control : ± 210 V, Typical Full time 16-bit accuracy Z axis control : ± 210 V, Typical Maximum 26-bit accuracy Voltage may vary from supplier to supplier, but performance should not. However, please specify Feedback controller Control system : Digital control by DSP Data acquisition controller Input signal : 4 channels (4 channels simultaneous) Communications interface Protocol : TCP/IP</p> <p>(3) Data Processing Unit Specifications Latest PC with Colour printer and 19" TFT Monitor</p> <p>(4) Software Online measurement Input signal : 4 channels</p>
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Scanning direction : Trace / retrace (simultaneous measurement possible) & Presetable to any angle

Scanning rate : 0.015 to 100 Hz

Measuring pixel number : 512×512, 256×256, 128×128, 64×64, 32×32

Feedback constant settings : Operating point, P gain, I gain

Z-axis output settings

- Sensitivity, offset (automated adjustment possible), operation monitor display

Image display during scanning

- Variable shade Image (top view)
- 3D display (shade, mix)
- Presetable Z coordinate display range
- Settable display color (400 color)
- Oscilloscope display (window display)
- Real-time tilt correction

Cross-section profile display

- Online length measurement and online profile display (window display) of line between any two points

Status display: Display operating status of main unit

Formatted observation: Registration and retrieve of measurement conditions

Calibration: Independent correction possible for each axis (X, Y, Z-axis)

Y scanning: On / Off possible, restart possible, start position setting possible

(up, medium, down)

Automated observation: Max. 256 presetting (scan range, offset, scan rate, comments)

Lever tune: 1kHz to 500kHz (Automated setting possible)

Amplitude / phase detection: 1kHz to 500kHz

Signal display

- Full Laser luminescence (Numeric display and indicator display)
 - Vertical difference value (Numeric display)
 - Feedback input signal value (Numeric display)
- Height (topographic) image, Deflection image, $Asin\delta$ image, $Acos\delta$ image, Amplitude image, Phase image

29	X ray powder Diffractometer	01	<p>A x-ray diffractometer is required for regular characterization of powder samples. The Diffractometer design should be such that it must be future upgradeable for attachments for doing x-ray reflectivity and grazing incident diffraction measurements. Detail specification of minimally required various basic components is as follows.</p> <p>X-Ray Generator: A fixed tube type variable power x-ray source (Cu-Target) with maximum output power of 3 KW. The source should be capable of a line focus of 10mm x 1mm so that it can deliver an effective line source of 10mm x 0.1mm at 6° take-off. The diffractometer will be mounted on the line source only. A source capable of a line focus of 10mm x 0.5mm so that it can deliver an effective line source of 10mm x 50 micron at 6° take-off will be preferable.</p> <p>Goniometer: A vertical scanning 2-circle goniometer (i.e goniometers with horizontal axes of rotation and horizontal sample mounting). The two circles must be independently controllable through built in software so that whenever required one can do theta- theta scan, & theta s – theta d linked: theta - 2 theta individual. Angular resolution for theta- theta circles should be +/- 0.0001 ° (theta) and 0.0002 ° (2 theta) . The error in angle measurement accuracy should be +/- 0.0002 ° or lower. The error in reproducibility of the angle measured between two consecutive runs, +/- 0.0002 ° or lower. With necessary goniometer Datum facility before the first run after every power ON, continuous and step scan facilities with selectable step size and scan speeds. All necessary kits (50 micron divergence slit, proper Al-absorbers etc.) and manual for theta and theta circle alignment. All necessary manuals for the diffractometer operation and maintenance including electronics.</p> <p>X-Ray Optics: Manually replaceable sets of divergence and scatter (0.5 ° , 1 ° 2 ° and 0.05mm) and receiving (0.05 ° ,1 ° , 2 ° w.r.t theta axis) slits. Incident beam and diffracted beam solar-slits. Counter Monocromoter for qualitative analysis. Glass sample holders.</p> <p>Detector system: A (NaI) type detector system with all necessary controls, hardware's, and software's. software alignable HV, Baseline and Window parameters settings for detector Datum, necessarily</p>

		<p>required before first scan-start after every power ON.</p> <p>Control Hardwares & Softwares: Complete with all necessary control and data acquisition electronic hardware's and software's for theta- theta scan, & theta s – theta d linked: theta - 2 theta individual, Intensity measurements etc. ASCII data output. The software should be compatible with available third-party XRD data base and search software's.</p> <p>Power Requirement: The power input of the machine should be compatible with the single phase, 50Hz, 220-230 V AC power supply.</p> <p>Optional Items: (a) All necessary attachments for doing X-ray reflectivity and Grazing incidents XRD of thin film samples. The Thin film attachment should comprise of Optical system of parallel beam method, Thin-film rotational sample stage, Monochromator for parallel beam, Pump for absorbing sample. (b) A water chiller with chilling power suitable for the heat load of above XRD generator.</p> <p>Protection: The system should be housed in a high safety standard radiation enclosure.</p> <p>Computer: Latest version with USB port, 19" flat SVGA monitor, Operating System, printer & UPS</p> <p>Spares: 5 years essential spares should be provided. The detailed list of spares should be provided</p> <p>Manual: One set of operating manual and service manual (in English) should be provided with the equipment.</p> <p>Training: Necessary Training should be provided to one or two officers at the manufacturing facilities and application laboratory. Prices should be quoted separately.</p> <p>Warranty: Minimum two years from the date of installation from the date of the satisfactory installation</p> <p>Users List: Number of installations in India of the quoted model with names and addresses of the institutes/ Laboratories should be provided.</p> <p>System Performance Guarantee: Peak position accuracy of theta/2Theta angle of at least +/- 0.01 ° must be demonstrated at site against NIST standard/Silicon Powder supplied by manufacturer along with equipment, without which installation will not be considered as complete. XRD Manufacturer must attach document along with their offer in support of fulfilling this clause of the technical specification. Factory Test Certificates & with respect to various parameters like</p>
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			goniometer angular reproducibility; minimum step size etc. should be enclosed along with the XIJD system The written undertaking regarding availability of spares including X-ray tube and warranty and maintenance must be provided.
30	Programmable Scanning Potentiostat and Galvanostat	01	Potentiostat/Galvanostat ,Potential range: -10 to 10 V or higher, Potentiostat rise time: < 1 μ s, Compliance voltage: \pm 12 V or higher,3- or 4-electrode configuration, Current range: 250 mA with option for power booster, Reference electrode input impedance: 1×10^{12} ohm, Input bias current: < 50 pA, Current measurement resolution: < 0.01 pA, Minimum potential increment in CV: 100 μ V, Automatic and manual iR compensation, Automatic potential and current zeroing, Potential, current low-pass filters, Serial port or USB selectable for data communication. The equipment should have external modulation with an arbitrary bipolar wave form for potential and current during potentiostatic or galvanostatic operation. It should also be capable of performing cyclic voltammetry, linear sweep voltammetry, Chronoamperometry, chronocoulometry, amperometric i-t measurements etc.
31	Zeta Potential Measurement Apparatus	01	Min particle size 2 nm,conductivity range 0-200 mS/cm, sample concentration, electrophoretic mobility range, and zeta potential range to be specified by the manufacturer.

INFORMATION TECHNOLOGY

S.NO	EQUIPEMNT NAME	TECHNICAL SPECIFICATION
32.	Basic CDMA /GSM Trainer Quantity: 01	Main power supply: 230 v, 50 hz Data source Data rate: 16 kbps, 8 kbps, 4 kbps Word length: 8 bits Data format: nrz Frequency synthesizer frequencies: 1.6 Mhz, 1.4mhz, 800 khz, 400 khz Power supply: \pm -5 v, \pm -12v dc, 200 ma
33.	Lan Trainer Quantity: 01	Pc to Pc connector Different topologies Client - server network Various protocols Data encryption and decryption
34.	Data Communication Trainer Quantity:01	Different method of parallel and Serial communication, wireless Communication, fsk modem Communication , visual indication, Printer interface, user friendly Software, optional application. Board for serial and parallel port
35.	Bluetooth Technology Quantity:01	Class 2 bluetooth carrier Frequency: 2.40 ghz, modulation Upto 1 mbps, frequency hopping, Transmission range upto 10 meters, Output interface: uart and usb

CHAPTER-5: PRICE SCHEDULE

Bill of Material and Price Schedule:

The Bill of materials must be included in the technical offer as well as commercial offer. However the Technical offer should not contain any price information.

S.No.	Item Description	Qty	Unit Price

Freight and Insurance

Duties + Taxes

Total Price

CHAPTER – 6 : BID SECURITY FORM

Whereas _____ I (hereinafter called “the Bidder”) has submitted its bid dated _____ (date of submission of bid) for the supply of _____ (name and/or description of the goods)(hereinafter called “the Bid”).

KNOW ALL PEOPLE by these, presents that WE _____ (name of bank) of _____ (name of the country), having our registered office at _____ (address of bank) (hereinafter called “the Bank”), are bound unto _____ (name of Purchaser) (hereinafter called “the Purchaser”) in the sum of _____ for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents. Sealed with the Common Seal of the said Bank this _____ day of _____

THE CONDITIONS of this obligation are:

1. If the Bidder withdraws it’s bid during the period of bid validity specified by the Bidder on the Bid Form; or
2. If the Bidder, having been notified of the acceptance of it’s bid by the Purchaser during the period of bid validity:
 - a) fails or refuses to execute the Contract Form if required ; or
 - b) fails or refuses to furnish the performance security, in accordance with the Instruction to Bidders.

We undertake to pay the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that in its demand the Purchaser will note that the amount claimed by it is due to it, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This guarantee shall remain in force up to one year after the period of the bid validity, and any demand in respect thereof should reach the Bank not later than the above date.

(Signature of the Bank)

1 Name of Bidder

CHAPTER – 7 : Checklist and Eligibility Criteria for Bidders

Bidders to indicate whether the following are enclosed by striking out the non-relevant option.

- a. Demand Draft of Rs. 2000/- toward cost of tender documents.
- b. Two separate bids duly filled in and signed in sealed envelopes
(i) Technical (ii) Commercial (YES/NO)
- c. The Demand Draft/BG for Rs.40,000/-towards Earnest Money Deposit (YES/NO)
- d. Undertaking that the successful bidder agrees to give a 10% security deposit and Performance Bank Guarantee. (YES/NO)
- e. Authorization letter from Principals enclosed. (YES/NO)
- f. Self Attested copy of Sales Tax Registration certificate (CST/VAT etc) as applicable (YES/NO)
- g. Agreements / Purchase orders / Completion certificates, if any, from the clients for whom similar supply has been made by the bidder in last three years (YES/NO)
- h. Solvency certificate (not older than twelve months) issued by scheduled/nationalized bank with which bidder holds the current account (YES/NO)
- i. Copy of PAN No. allotted by the concerned authorities (YES/NO)
- j. A copy of the Un-priced Commercial bid (YES/NO)
- k. List of deliverables as per Chapter-5 (YES/NO)
- l. Copy of ISO 9002 or equivalent Certificate (YES/NO)
- m. Copy of DGS&D Registration if any.
(YES/NO)
- n. Compliance sheet with any deviation w.r.t. the terms (YES/NO)
- o. Acceptance of BU, Bhopal Cargo Agent (YES/NO)
- p. Bank charges agreed for outside India (Chapter-3, S.No.2) (YES/NO)
- q. LD clause agreeable. (YES/NO)
- r. Supply of spares for 10 years. (YES/NO)
- s. Amalgamation/Acquisition: Successor agreeable to fulfil the contractual obligations. (YES/NO)
- t. Acceptance of warranty period and Free replacements during warranty period (YES/NO)