

**Tender Documents for the Supply of  
Electrical Engineering Lab Equipments**

**To  
KU College of Engineering & Technology**



**Kakatiya University  
Hanamkonda  
Warangal – 506 009  
Telangana State**



# KAKATIYA UNIVERSITY

Warangal – 506 009, Telangana State

No. 189/KUCE&T/2019

Dated: 06-05-2019.

## Tender Notification

Sealed tenders are invited for the supply of laboratory equipment for **KU College of Engineering & Technology**. Detailed tender documents with specifications, terms and conditions etc., can be had from the website [www.kakatiya.ac.in](http://www.kakatiya.ac.in). The last date for receipt of the tender is 21-05-2019.

**PRINCIPAL**

## Tender Summary

Tender Number	<b>1166/KUCE&amp;T/2019 Dated: 06-03-2019</b>
Amount of EMD (Rs.)	<b>2.5 %</b> of the quoted value
Tender Document Cost (Rs.) (Downloadable one)	<b>Rs.5000/-</b> (D.D.in favour of Principal, KU College of Engineering & Technology, Warangal- 506009, Telangana State, India)
Bid Submission	<b>21-5-2019</b>
Bid Outer Cover Opening	<b>21-5-2019 (after 5.00 PM)</b>
Bid Opening (Technical)	Will be decided on the day of opening.

**PRINCIPAL**

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## 1. Introduction

**Kakatiya University** was established on 19th August, 1976 in the combined State of Andhra Pradesh to fulfill the aspirations of the Telangana people for higher education. The founding of the University was in fact a historic event in the sense that heralded a new era in the realms of higher education of this region. The erstwhile Post-Graduate Centre of Osmania University was upgraded and named “Kakatiya University” for residential teaching, research and affiliation. The development of the University over the years has been gradual but impressive. The University was initially accredited with B+ grade by the NAAC in 2002 and reaccredited with A grade in 2008.

The University is now offering programmes in Engineering, Pharmacy, Law, Computer Science, Business Management, Education, Science, Arts, Commerce, Oriental courses in the University, constituent and affiliated colleges located in three districts of Northern Telangana State, viz., Warangal, Khammam and Adilabad. In addition, the School of Distance Learning and Continuing Education (SDLCE) is offering a large number of programme through distance mode. Further, the University is vibrant with research activities carrying out the projects sponsored by various funding agencies like UGC, DST, CSIR, ICSSR, AICTE, ICHR, DBT, etc. Now, Kakatiya University is about to cross the milestone of forty (40) years and is poised to achieve greater academic excellence with dedication and commitment in the years to come.

## 2. Invitation for Bids

1. This invitation to the tenderer is for the supply of the Laboratory Equipment for Civil Engineering to Kakatiya University College of Engineering & Technology, Gundla Singaram, Hanamkonda, Warangal District - 506 009, Telangana State.
2. Tenderers are advised to study the tender document carefully. Submission of tender shall be deemed to have been carried out after careful study and examination of the tender document with full understanding of its implications.
3. Sealed offers prepared in accordance with the procedures enumerated in the instructions to Tenderers (3) clause 1 should be submitted to the office of The Principal, KU College of Engineering & Technology, Kakatiya University, Gundla Singaram, District Warangal - 506 009, Telangana State, not later than the time laid down, at the address given in the schedule for invitation to tender under Clause 6.
4. All bids must be accompanied by an Earnest Money Deposit (EMD) of 2.5% of the quoted value of all the instruments, and D.D. of Rs. 5000/- towards document cost (Download one) in favour of The Principal, KU College of Engineering & Technology, Warangal (Separate D.D. for Document Cost and EMD & Separate Bid for each Laboratory Equipment).
5. This tender document is nontransferable.
6. Schedule for invitation to tender

Last date for submission of bid documents	27-03-2019
Date till which the Bid is Valid	180 days from the date of submission
Venue of submission of Bid documents	Office the Principal, KU College of Engineering & Technology, Gundla Singaram, Kakatiya University, Warangal -506009, Telangana State

7. Tender through e-mail / fax will not be considered. **Tender form without the commercial bid will not be considered.**

**Note:** The University shall not be responsible for any postal delay about non-receipt / non-delivery of documents.

### 3. Instructions to Tenderers

#### A. Introduction

##### (i). Bid Submission Procedure

Two-Cover-System is to be followed for this tender:

- (a) Technical Bid in a separate Cover
- (b) Commercial Bid in a separate Cover.

**i.1** Technical and Commercial Bid by the Tenderer(s) should be placed in two separate envelopes super-scribed with separate bid titles as follows:

- (a) Technical Bid (2 copies) with **EMD amount and document cost**.
- (b) Commercial Bid (2 copies).

Tender without the Commercial Bid will be rejected.

**Tender should be submitted separately for each Laboratory Instruments.**

**i.2** The tenderers have to qualify for the commercial bid.

**i.3** Please note the price should be mentioned only in the Commercial Bid.

**i.4** Item-wise-pricing should be given in the commercial bid as per the format specified.

**i.5** All the documents, viz., Technical Bid and Commercial Bid prepared as above are to be kept in two sealed covers super-scribed with Tender Number, Due Date, Name of Laboratory, and **“Do not open before, 21-5-2019”** should be specified.

**i.6** The cover thus prepared should also indicate **clearly the name and address of the Tenderer.**

P.S.: In case, fine tuning of technical specifications are required, the University Reserves the Right to Ask for Revised Technical Bid. In the absence of revised Commercial Bid, the original shall be held valid.



**(ii). Cost of Tender**

**ii.1** The Tenderer shall bear all costs associated with the Preparation and Submission of Bid, including cost of presentation for the purposes of clarification of the Bid.

**ii.2** If so desired by the University and University will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Tendering Process.

**ii.3** The Tenderer is expected to examine all instructions, forms, terms and specifications in the Tender Document. Failure to furnish all information required in the Tender Document or Submission of a bid not substantially responsive to the Tender Document in every respect will be at the Tenderer's risk and may result in the rejection of the Bid.

**ii.4 Clarification of Tender Document**

A prospective Tenderer requiring any clarification of the Tender Document May notify the University in writing at the University's mailing address.

The University will respond in writing to any request for clarification of The Tender Document, received. Written copies of the University response (including and explanation of the query, but without identifying the source of inquiry) will be given to all prospective Tenderers who have received the Tender Documents.

**ii.5 Amendment of Tender Document**

**ii.5.1** At any time the University may for any reason, whether at its own initiative or in response to a clarification requested by a prospective Tenderer, modify the Tender Document by an amendment.

**ii.5.2** The amendment will be notified in writing or by fax or email or cable to all prospective Tenderers who have received the Tender Documents and will be binding on them.

**ii.5.3** In order to afford prospective Tenderers reasonable time in which to take the amendment into account in preparing their bids, the University may, at its discretion, extend the last date for the receipt of Bids.

## B. Preparation of Bids

### (i) Language of Bids

The Bids prepared by the Tenderer and all correspondence and documents relating to the bids exchanged by the Tenderer and the University shall be written in English.

### (ii) Documents Comprising the Bids

The Bids prepared by the Tenderers shall comprise of following components:

#### (a) Annexure - A:

S.No.	Eligibility Criteria	Requisite Document
1.	The Tenderer must have reputed dealing Electrical equipment for the last five years.	Qualifying data duly filled in as per relevant Proforma provided in the bid proposal that the Tenderer is eligible to bid and is qualified to perform the contract, if its bid is accepted (Proforma)
2.	The Tenderer Company must have a valid latest Income-Tax Certificate.	Copy of Latest Valid Income Tax Clearance Certificate / PAN Certificate. ( <b>Not Necessary for foreign companies</b> ) DD in Favour of <b>The Principal, KU College of Engineering &amp; Technology, Warangal - 506 009, Telangana State, India</b>
3.	EMD – 2.5% of the quoted value	
4.	Cost of the Tender document (For each instrument)	<b>Rs. 5000/-</b> (D.D.in favour of <b>The Principal, KU College of Engineering &amp; Technology, Warangal – 506 009, Telangana State, India</b>
5.	The Tenderer must submit proposal sheet as per terms of the Tender document certifying that they accept all terms and Conditions of the Tender Document	Bid Proposal sheet duly filled in, signed and complete in all Aspects. (Proforma -I)

6.	Is the Tenderer a Public/Private Limited Company having its Corporate/Head Office in Telangana State and a local direct office either in Hyderabad or Warangal?	Address, Contact Person, Phone/Fax/Email of all Directors along with PAN / IEC / VAT / TAN / TIN Service
7.	Are they authorized for the equipment quoted by the Manufacturer?	Tax Details. Registration Number along with Date of Registration is to be provided. Letter of authorization from the Manufacturer

**(b) Technical Bid shall consist of following:**

Technical Details
Name & Designation of the person responding to the tender
Name& Designation of person for contact

**(c) Commercial Bid shall consist of the following:**

Commercial Deviations
Commercial Bid

- i) Bid prices duly filled, signed and complete as per the Price Schedule on the prescribed Quotation Proforma (Proforma-IV). The Tenderer shall indicate the firm prices, the Terms of Reference of which are given in the Technical Specifications. Two Soft copies of deviations in the specified format given in Proforma-IV.
- ii) Commercial Deviations from the terms and conditions and specifications as specified in the Bidding Documents (Proforma-V). Two Soft copies of deviations in the specified format given in Proforma-V. The University reserves the right to carry out the capability assessment of the Tenderers and is not bound to place order on the lowest bidder. The University's decision shall be final in this regard.

## **4. Terms and Conditions of the Tender**

### **4.1 Delay in the Vendor's Performance and Penalty**

4.1(a) Delivery of the Goods and performance of Services shall be made by the Vendor in accordance with the time schedule specified by the purchaser in this schedule of requirement.

4.1(b) An unexcused delay by the vendor in the performance of its delivery obligations shall render him liable to any or all of the following penalties: Imposition of liquidated damage and termination of this order for default.

### **4.2 Professional Practice**

The Tenderer shall adhere to professional engineering and consulting standards recognized by international professional bodies and shall observe sound management, technical and engineering practices. It shall employ appropriate advanced technology and safe and effective equipment, machinery, material and methods. The Tenderer shall always act in respect of any matter relating to this contract, as faithful advisors to the University and shall, at all times, support and safeguard the University's legitimate interests in any dealings with the third party.

### **4.3 Use of Contract Document and Information**

4.3(a) The Tenderer shall not, without the University's prior written consent, disclose the contract or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of University in connection there with to any person other than a person employed by the Tenderer in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.

4.3(b) The Tenderer shall not without the purchaser's prior written consent, make use of any document or information.

4.3(c) Any document other than the contract itself shall remain the property of the University and shall be returned (in all copies) to the University on completion of the tenderers performance under the contract if so required by the University.

#### **4.4 Earnest Money and Security Deposit**

Vendor/Tenderer(s) shall deposit EMD along with the tender document in the form of Bank Demand Draft in favour of the Principal, KU College of Engineering & Technology, Warangal. Tenders without Earnest Money will be rejected.

#### **4.5 Schedule of Payment**

4.5.1 Payment will be made only after the installation of the items and after issue of certificate by the Committee.

4.5.2 VAT / Sales Tax, Services Tax and Octroi shall be paid on actual, as applicable.

4.5.3 Tenderer should specify the TAN / PAN / **TAN** / TIN.

4.5.4 All payments shall be released within thirty (30) days from the date of submission of bills in triplicate to the Principal, Kakatiya University College of Engineering & Technology, Gundla Singaram, Warangal – 506009.

#### **4.6 Warranty Period and Maintenance Services**

The Vendor will be responsible for the comprehensive maintenance (free of charge) during the warranty period of 36 months for Equipments (Active components) after the implementation at Kakatiya University College of Engineering & Technology, Gundla Singaram, Warangal – 506 009.

#### **4.7 Prices**

The prices quoted for the Items/Services shall be firm throughout the period of contract & this contract will be valid up to the date of final payment to the supplier and shall not be subject to any upward modification whatsoever. The rates should be quoted for CIP at sites. The commercial bids must be on the prescribed format as given in this document.

#### **4.8 Taxes and Duties**

The Tenderer shall be entirely responsible for all taxes, duties, license fees, Octroi, etc. incurred until delivery of the ordered Goods to the purchaser. However, VAT / Sales Tax, Surcharge, Professional / Service Tax, Octroi in response of the transaction between the purchaser and the Tenderer shall be payable extra by the purchaser if so stipulated in the notification award.

#### **4.9 Insurance**

The Tenderer shall be responsible for all the Goods supplied under the contract and these shall be fully insured against loss or damage incidental to manufacture or acquisition transportation, storage, delivery, and installation, commissioning and running.

#### **4.10 Tenderers Personnel**

The Tenderer shall employ and provide such qualified and experienced personnel as required to perform the services under the contract.

#### **4.11 Confidentiality**

The Tenderer and their personnel shall not, either during the term disclose any proprietary or confidential information relating to the services, contract or the University's business or operations without the prior written consent of the University.

#### **4.12 Force Majeure**

Notwithstanding the provisions of the tender, the Tenderer shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that it's delay in performance or other failure to perform its obligations under the contract is the result of an event of Force Majeure.

**4.12(a)** For purposes of this Clause, "Force Majeure" means an event beyond the control of the Tenderer and not involving the Tenderer and not involving the Tenderer's fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of the University, either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

**4.12(b)** If a Force Majeure situation arises, the Tenderer shall promptly notify the University in writing of such conditions and the cause thereof. Unless otherwise directed by the University in writing, the Tenderer shall continue to perform its obligations under this order as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the

Force Majeure event, the University may terminate its order by giving a written notice of minimum 30 days to the Tenderer, if as a result of Force Majeure, the Tenderer being unable to perform a material portion of the services for a period of more than 60days.

**4.13** The University reserves the right to accept or reject any Tender in whole or in part without assigning any reason therefore.

**4.14** The University is under no obligation to accept the lowest Tender.

**4.15 Other Conditions**

**4.15(a)** All disputes, differences, claims and demands arising under or pursuant to or touching the contract shall be referred to the sole arbitrator of the **Principal**, Kakatiya University College of Engineering & Technology, Warangal – 506009. The award of the sole arbitrator shall be final and binding on both the parties under the provisions of the arbitration Act, 1940 or by statutory modification re-enactment thereof for the time being in force. Such arbitration shall be held at Warangal Jurisdiction only.

**4.15(b)** In all matters and disputes arising there under, the appropriate Courts at Warangal Jurisdiction shall have jurisdiction to entertain and try them.

**4.15(c)** Reputed manufacture / Authorized dealers / Registered Contract or have EA / ESA Certificate with validity.

**5. Detailed Technical Specifications**

**Please refer Annexure - I.**



## 6. Bid Proposal Proforma

### Proforma-I

#### Bid Proposal Sheet

Tenderer's Proposal Reference No. & Date :

Tenderer's Name & Address :

Person to be contacted :

Designation :

Telephone No.:

Email Id.:

Fax No.:

To  
Principal  
KU College of Engineering & Technology  
Kakatiya University  
Warangal – 506 009

#### **Subject: Proposal for supply of equipment**

Dear Sir,

1. We, the undersigned Tenderers, having read and examined in detail the specifications and all bidding documents in respect of supply of equipment do hereby purpose to provide Hardware & Technical Services as specified in the bidding document.

#### **2. Price and Validity**

**2.1** All the prices mentioned in our proposal are in accordance with the terms as specified in bidding documents. All the prices and other terms and conditions of this proposal are valid for a period of 180 calendar days from the date of opening of the bids.

**2.2** We do hereby confirm that our bid prices include all taxes including Income Tax & Professional Tax.

**2.3** We have studied the Clauses relating to Indian Income Tax and hereby declare

that if any Income Tax, Surcharge on Income Tax and any other Corporate Tax is altered under the law, we shall pay the same.

### **3. Earnest Money**

We have enclosed the earnest money (2.5% of the quoted value) and cost of the tender document (Rs.5000/-) in the form of Bank Demand Draft of

It is liable to be forfeited in accordance with the provisions of tender document.

#### **3.1 Deviations**

We declare that all the services shall be performed strictly in accordance with the Technical specifications and other tender document except the deviations as mentioned in the Technical deviation Proforma (Proforma - IV). Further we agree that additional conditions, if any, found in the proposal documents, other than those stated in deviations Proforma, shall not be given effect to.

#### **3.2 Bid Pricing**

We further declare that the prices stated in our proposal are in accordance with your terms & conditions in the bidding document.

#### **3.3 Qualifying Data**

We confirm having submitted in qualifying data as required by you in your tender document. In case you require any further information/ documentary proof in this regard before evaluation of our bid, we agree to furnish the same in time to your satisfaction.

4. We hereby declare that our proposal is made in good faith, without collusion or fraud and the information contained in the proposal is true and correct to the best of our knowledge and belief.

Thanking you,

Yours Sincerely

(Signature)

Date:

Name:

Place:

Designation:

Business Address:

Seal

## Proforma - II

### Particulars of Tenderer(s)

- Tender's Particulars for Tender No. : .....
1. Name of the Tenderer : .....
  2. Address of the Tenderer : .....
  3. Year of Establishment : .....
  4. Name of the affiliated firms (if any) : .....
  5. Tenderer's proposal number & date : .....
  6. Name & address of the officer : .....  
to whom all references shall be  
made regarding this tender
  7. Annual turnover of the firm for the : .....  
last year and name of the Institutions /  
Universities where the network has  
been established. (separate List of  
Institutions Universities may be furnished)
  8. Contact Person/ Address/Telephone No.s : .....  
of the office who will be responsible for  
Executing this project.
  9. Earnest Money Deposited : .....
- DD NO/ Bank Details  
Telex:                      Telephone:                      Fax No:

As of this date the information furnished in all parts of this form is accurate and true to the best of my knowledge.

**Witness:**

Signature : .....	Signature : .....
Name : .....	Name : .....
Designation : .....	Designation : .....
Address : .....	Address : .....
Company : .....	Company : .....
Date : .....	Date : .....

Company Seal  
(With name & designation  
Of the person signing the tender)

### Proforma - III

**Subject: Technical Deviations.**

Dear Sir,

Following are the Technical deviations & variations from the expectations to the specifications. These deviations and variations are exhaustive. Except these deviations and variations, the entire equipment shall be provided as per your specifications and documents. A soft copy of the format should be submitted duly filled in, on the CD. In case of any variation between the soft and hard copy versions, the Principal, Kakatiya University, Warangal – 506 009 will consider the hard copy version.

S.No.	Clause No	Page No.	Statement of Deviations and Variations

Date

Signature

Place

Name

Seal

## Proforma - IV

### Price Schedule

Please fill in all the fields of the format.

S. No.	Item	Qty	Total Price in Figures (Rs)	Total Price in Words (Rs)

Date

Signature

Place

Name

Seal

## Performa - V

### Subject: Commercial Deviations

Dear Sir,

Following are the Commercial deviations & variations from the exceptions to the specifications of hardware. These deviations and variations are exhaustive. Except these deviations and variations shall be provided as per your specifications and documents.

S.No.	Clause No.	Page No.	Statement of Deviations and Variations

Date

Signature

Place

Name

Seal

## 7. Abbreviations and Acronyms

<b>Acronym and Abbreviation</b>	<b>Description</b>
EMD	Earnest Money Deposit
DD	Demand Draft
CD	Compact Disc
IEC	Importer – Exporter Code
LAN	Local Area Network
WAN	Wide Area Network
VAT	Value Added Tax
CEO	Chief Executive Officer
UGC	University Grants Commission
AMC	Annual maintenance Cost
PAN	Permanent Account Number
TAN	Tax deduction and Collection Account Number
TIN	Tax Information Network
CIP	Carriage Insurance paid to

## Annexure - A

### Commercial Compliance Statement (Note: Fill up legibly)

S. No.	Eligibility Criteria	Yes/No	Documents Attached
1.	Is the Tenderer have repute dealing with Civil Engineering equipment for the last five years?		
2.	Does the Tenderer have ISO 9001 Certification for its services Practice?		
3.	Does the Tenderer have a valid Latest Income Tax Certificate?		
4.	Has the tendering company posted profit, having a turnover of at least 5 times of the quoted value for the last three financial years?		
5.	EMD – 2.5% of the quoted value		
6.	Cost of tender document ( Rs. 5000/-) for each instrument		
7.	Has the Tenderer submitted proposal sheet as per terms of the Tender document certifying that they accept all terms and Conditions of the Tender Document?		
8.	Is the Tenderer a Private / Public Limited Company having its resident engineer Corporate / Head Office in Hyderabad / Warangal and a local direct office in Hyderabad / Warangal?		
9.	Are they authorized for the equipments quoted by the Manufacturer?		



## Annexure - I

### (1) Control Systems Engineering

S. No.	Item	Specifications	Quantity
1.	Second Order system study unit	--	01
2.	Lead-lag network study unit	In built signal source Necessary active components to build lead, lag circuits Built in power supply	01
3.	PID controller trainer	In built lead-lag network	01
4.	Synchro Transmitter Receiver pair	--	01
5.	Closed loop speed control of 3-phase Induction motor (2 HP, 415 V)	3-phase induction motor arrangement with tacho- generator In built power supply Necessary interface devices Necessary meters	01
6.	Closed loop speed control of DC motor (2 HP, 415 V)	DC motor arrangement with tacho-generator DC motor: 12 V DC, 1.1 A, 1500 RPM In built power supply Necessary interface devices Necessary meters	01
7.	Speed Torque characteristics of DC servo motor	In built power supply Necessary interface devices Necessary meters	01
8.	Speed Torque characteristics of AC servo motor	In built power supply Necessary interface devices Necessary meters	01
9.	Compensation Design	--	01
10.	PID controller	--	01
11.	Linear System Simulator	First order and second order system simulator Built in signal source (Square & Triangular wave) Variable gain amplifier Uncommitted amplifier for phase measurement	01

<b>12.</b>	Stepper motor controller with 8085 microprocessor	--	01
<b>13.</b>	DC motor position control system	--	01
<b>14.</b>	Analog PID controller	--	01
<b>15.</b>	ON/OFF Temperature Controller	--	01
<b>16.</b>	Digital Multimeters Model No: VC-97 3 <sup>3</sup> / <sub>4</sub> DMM	DC Voltage: 400 mV-1000V ( $\pm 0.5\%$ ) AC Voltage: 400 mV-750V ( $\pm 0.5\%$ ) DC Current: 400 $\mu$ A-10A ( $\pm 1\%$ ) AC Current: 400 $\mu$ A-10A ( $\pm 1\%$ ) Resistance: 400 $\Omega$ -40 M $\Omega$ ( $\pm 1\%$ ) Capacitance: 4 nF – 200 $\mu$ F ( $\pm 2.5\%$ ) Frequency: 100 Hz-30 MHz ( $\pm 0.5\%$ ) Input Impedence : 10 M $\Omega$ Sampling Rate: 3 times /second AC Frequency response: 40- 400 MHz	15

## 2. Electrical Machines

S. No.	Item	Specifications	Quantity
1.	1- $\Phi$ Autotransformer (Variac)	Phase: Single (1- $\Phi$ ) Input: 230V Output: 0-270V Frequency: 50 Hz	08
2.	1- $\Phi$ Transformer	Phase: Single(1- $\Phi$ ), Capacity: 3 kVA Input: 0-200-246-400 with taps (Primary) Output: 230V (Secondary) Frequency: 50 Hz	03
		Phase: Single(1- $\Phi$ ), Capacity: 2 kVA Input: 0-115-200-230 with taps (Primary) Output: 230V (Secondary) Frequency: 50 Hz	03
		Phase: Single(1- $\Phi$ ), Capacity: 1 kVA Input: 0-100-200-230 with taps (Primary) Output: 230V (Secondary) Frequency: 50 Hz	03
3.	3- $\Phi$ Autotransformer (Variac)	Phase: Three (3- $\Phi$ ) Input: 415V Output: 0-470V Frequency: 50 Hz	06
4.	DC Series Motor (with 2-point starter) With loading arrangements	Voltage: 220 V, 12 A Power: 3 Hp With current $I_A=12A$ RPM: 1500 Type: Series 2-point starter: 1 No.	To conduct load test 01
5.	DC Shunt Motor Generator set (with 3-point starter)	Voltage: 220 V, 10A Power: 5 Hp With current $I_A=10A$ , $I_F=0.6A$ at 220V RPM: 1500 Type: Shunt 3-point starter: 1 No.	To determine characteristics To conduct load test 02
6.	DC Compound Motor Generator set (with 3-point starter)	Voltage: 220 V, 10A Power: 3 Hp With current $I_A=10A$ , $I_F=0.6A$ at 220V RPM: 1500 Type: Shunt 3-point starter: 1 No.	To determine characteristics To conduct load test 02
7.	DC Shunt Motor coupled with 3-phase Synchronous Generator set (with 3-point starter and exciter unit)	<b>Motor:</b> Voltage: 220 V, 20 A Power: 5 Hp With current $I_A=20A$ , $I_F=0.8A$ at 220V RPM: 1500 Type: Shunt	To determine voltage regulation by various methods To conduct parallel operation 05

		3-point starter: 1 No. <b>Generator:</b> Voltage: 415V, 5A Power: 3 kVA With current $I_A=5$ A, $I_F=1.4$ A at 220V RPM: 1500, star connected 0.8 pf		
8.	3-phase slip ring induction motor with loading arrangement	Voltage: 415 V, 10 A Power: 5 Hp RPM: 1440, delta Connected	To conduct load test	01
9.	3-phase squirrel cage induction motor with loading arrangement	Voltage: 415 V, 10 A Power: 5 Hp RPM: 1440, delta Connected	To conduct load test To conduct no-load and blocked rotor test	02
10.	3-phase Synchronous motor with loading arrangement with exciter unit	Voltage: 415V, 5A Power: 3 kVA With current $I_A=5$ A, $I_F=1.4$ A at 220V $I_F=1.4$ A at 220V RPM: 1500, star connected 0.8 pf	To conduct load test To determine V and inverted V curves	02
11.	Single phase capacitor start –run induction motor with loading arrangement	Voltage: 230 V, 10A Power: 3 Hp RPM: 1500	To conduct load test	01
12.	Three phase Induction motor with pole changing arrangement	Voltage: 415 V, 10 A Power: 5 Hp RPM: 1440, delta Connected	To conduct speed control	01
13.	Single phase Induction motor with loading arrangement	Voltage: 230 V, 10A Power: 3 Hp RPM: 1500	To conduct speed control	01
14.	Scott connected Transformer	Phase: Three (3- $\Phi$ ) Input: 415V Output: 0-234V Frequency: 50 Hz Capacity: 3 kVA		01
15.	Rheostats	Rating: 185 $\Omega$ / 1.1 A 350 $\Omega$ / 1.1 A 100 $\Omega$ / 3 A 26 $\Omega$ / 4.1 A		05 05 03 02
16.	Voltmeters (Moving Coil type-DC)	Housed in Bakelite case with knife edge pointer & anti parallax mirror scale of 140 mm. Accuracy as per ISS 1248/83 Range: 0-30V, Moving coil Type; Make: MECO Range: 0-300V, Moving coil Type; Make: MECO		03 06

17.	Voltmeters (Moving Iron type-AC)	Housed in Bakelite case with knife edge pointer & anti parallax mirror scale of 140 mm. Accuracy as per ISS 1248/83 Range: 0-300/600V , Moving Iron Type; Make: MECO Range: 0-150/300/600V , Moving Iron Type; Make: MECO	04 04
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18.	Ammeters (Moving Coil type-DC)	Housed in Bakelite case with knife edge pointer & anti parallax mirror scale of 140 mm. Accuracy as per ISS 1248/83 Range: 0-2A, Moving Coil Type; Make: MECO Range: 0-3A, Moving Coil Type; Make: MECO Range: 0-15A, Moving Coil Type; Make: MECO	03 04 02
19.	Ammeters (Moving Iron type-AC)	Housed in Bakelite case with knife edge pointer & anti parallax mirror scale of 140 mm. Accuracy as per ISS 1248/83 Range: 0-5A-10A, Moving Iron Type; Make: MECO Range: 0-10/20 A, Moving Iron Type; Make: MECO Range: 0- 15A, Moving Iron Type; Make: MECO Range: 0-30 A, Moving Iron Type; Make: MECO	02 02 02 02
20.	Wattmeters	Housed in Bakelite case with knife edge pointer & anti parallax mirror scale of 140 mm. Accuracy as per ISS 1248/83 Range: 150/300/600 V, 2.5/5 A, LPF; Make: MECO Range: 75/150/300 V, 5/10 A, UPF; Make: MECO Range: 150/300/600 V, 5/10 A, UPF; Make: MECO Range: 150/300/600 V, 10/20 A, UPF; Make: MECO Range: 150/300/600 V, 10/20 A, LPF; with reversible switch; Make: MECO	02 02 02 02 02
21.	Resistive Load Bank (1- $\Phi$ )	5 kW, 15/20 A Should consists of 10 resistive loads each 0.5 kW; Make: STEAD	02
22.	Tachometer	Range: 0-10000 RPM, contact type (Analog) ; Make: MECO Range: 0-10000 RPM, non contact type (Digital) ; Make: MECO	02 10
23.	Digital Multimeters 3 <sup>3</sup> / <sub>4</sub> DMM	DC Voltage: 400 mV-1000V ( $\pm 0.5$ %) AC Voltage: 400 mV-750V ( $\pm 0.5$ %) DC Current: 400 $\mu$ A-10A ( $\pm 1$ %) AC Current: 400 $\mu$ A-10A ( $\pm 1$ %) Resistance: 400 $\Omega$ -40 M $\Omega$ ( $\pm 1$ %) Capacitance: 4 nF – 200 $\mu$ F ( $\pm 2.5$ %) Frequency: 100 Hz-30 MHz ( $\pm 0.5$ %) Input Impedence : 10 M $\Omega$ Sampling Rate: 3 times /second AC Frequency response: 40- 400 MHz	05
24	Salient Pole Type Alternator		01

### 3.Electronics and Drives

<b>S. No.</b>	<b>Name Of the Equipment</b>	<b>Quantity</b>
1.	Study of static characteristics of a SCR, MOSFET, IGBT, DIAC, TRAAC	01
2.	Full wave rectifiers with R & RL loads.	01
3.	1 – $\Phi$ phase voltage controllers for R & RL loads	01
4.	Study unit of forced commutation techniques of SCR	01
5.	SCR Circuit for DC motor control	01
6.	Chopper circuit	01
7.	Characteristics of DC servo motor	01
8.	Characteristics of AC servo motor	01
9.	Study unit of 1- $\Phi$ inverter circuit	01
10.	UJT relaxation oscillator	01

#### 4. Measurements and Instrumentation Lab

S.No.	Name of the equipment	Specifications	Quantity
1	Measurement of Resistance using Kelvin's Double Bridge	TRAINER KIT	2
2	Measurement of Inductance using Maxwell's Bridge	TRAINER KIT	2
3	Measurements of Capacitance using Schering Bridge	TRAINER KIT	2
4	Extension of range of ammeter	Ammeter (0-50)mA Ammeter (0-100)mA	2
5	Measurement of Displacement using LVDT	TRAINER KIT	2
6	Measurement of Strain using Strain Gauge	TRAINER KIT	2
7	Measurement of 3-phase power using single wattmeter and two CTS	Wattmeter Current transformers	2
8	Measurement of Frequency and Phase angle using lissajous patterns	CRO AFO	2
9	Measurement of Ratio and Phase Angle Error of Current Transformer	TRAINER KIT	2
10	Calibration of Energy Meter	TRAINER KIT	2

#### 5. Basic Electrical Lab

S.No.	Item	Specifications	Quantity
1	Digital Ammeter	0-50 A	6
2	DC Voltmeter	0-30 Volts	6