Women Institute of Technology, Sudhowala, Dehardun,New Uttarakhand Technical Unvesity campus P.O. Sudhhowala Premnagar Dehardun

INVITATION LETTER

Package Code: TEQIP-III/2019/UK/wits/169 **Current Date: 11-Dec-2019**

Package Name: WIT/EE/004 **Method: Shopping Goods**

To,

Sub: INVITATION LETTER FOR WIT/EE/004

Dear Sir,

1. You are invited to submit your most competitive quotation for the following goods with item wise detailed specifications given at Annexure I,

Sr. No	Item Name	Quantity	Place of Delivery	Installation Requirement (if any)
1	Electrical Machine Lab	1	WIT Dehradun	yes

2. Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme [TEQIP]-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.

3. **Quotation**

3.1 The contract shall be for the full quantity as described above.

3.2 Corrections, if any, shall be made by crossing out, initialling, dating and re writing.

3.3 All duties and other levies payable by the supplier under the contract shall be included in the unit Price.

3.4 Applicable taxes shall be quoted separately for all items.

3.5 The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

3.6 The Prices should be quoted in Indian Rupees only.

4. Each bidder shall submit only one quotation.

5. Quotation shall remain valid for a period not less than **180**days after the last date of quotation submission.

6. Evaluation of Quotations: The Purchaser will evaluate and compare the quotations determined to be Substantially responsive i.e. which

6.1 are properly signed; and

6.2 Confirm to the terms and conditions, and specifications.

7. The Quotations would be evaluated for all items together.

8. Award of contract The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

8.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of Contract.

8.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be Incorporated in the purchase order.

9. Payment shall be made in Indian Rupees as follows:

Payment Description	**Expected Delivery Period (in Days)**	**Payment Percentage**
Satisfactory Delivery & Installation	30	10
Satisfactory Acceptance	30	90

10. Liquidated Damages will be applied as per the below:
Liquidated Damages Per Day Min %: N/A
Liquidated Damages Max %: N/A

11. All supplied items are under warranty of **N/A** months from the date of successful acceptance of items and AMC/Others is **.**

12. You are requested to provide your offer latest by **04:30** hours on **25-Dec-2019.**

13. Detailed specifications of the items are at Annexure I.

14. Training Clause (if any)

15. Testing/Installation Clause (if any)

16. Performance Security shall be applicable**: 0%**

17. Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly indicating the model quoted for.

18. Sealed quotation to be submitted/ delivered at the address mentioned below, **Women Institute of Technology, Sudhowala, Dehardun,New Uttarakhand Technical Unvesity campus P.O. Sudhhowala Premnagar Dehardun**

19. We look forward to receiving your quotation and thank you for your interest in this project.

(Authorized Signatory)
Name & Designation

Annexure I

Sr. No	Item Name	Specifications
1	Electrical Machine Lab	As per the list attached

ELECTRICAL MACHINE TRAINER

Technical Specifications

A) Specifications of panels

- **Input 3 phase DOL Starter panel**
  - 4 pole MCB of 415 V/4A.
  - DOL 9A Contractor with 230V / 50 Hz/11VA COIL.
  - Bimetallic thermal O/L relay with range 1.4A-2.3A.
- **Integrated (1 Ph.) measurement on panel**
  - 0-300VAC, CT 1A/5A
  - LCD/LED Display, Aux supply 230VAC 45-65Hz, 5W.
  - V, A., Hz, PF, KW, KVA, KVAr, Energy.
  - 1A/5A current selector switch
- **3 Ph. Bidirectional power cum Energy meter panel**
  - Bidirectional Multifunction
  - 3 Phase ¾ wire, 415V, CT Input 5A
  - LCD/LED display, Aux supply 230V, 45-65 Hz, 5W
  - V,I., Hz, pf, KVA, KW, KWH
- **FWD/REV, Star-Delta starter panel**
  - FWD/REV, 3 pole 3 way switch with centre OFF, 6A/440V.
  - Star /Delta switch 3 pole 3 way with centre OFF, 6A/440V.
- **3 Phase wound Rotor & Sync. Motor panel**
  - Rotor resistors of 30E/5A with 3 tap of 15E, 20E, 30E each-3 Nos.
  - Rotor resistor selector switch, 3 pole. 6 Way 6A/440 V.
  - DC Rotor excitation with circuit breaker (3Amp.)
- **1ph.Motor, Alternator & Sync. Motor Panel**
  - 1 ph. MCBs of 4A/1.6A 1 EACH.
  - 2 no. 2P2W selector switches to run as 1 ph. alternator then as synchronous motor.
  - 8A pushbutton switches to simulate as centrifugal switch.
- **DC voltmeter and DC ammeter panel**
  - a) DC voltmeter(0-300V)
  - b) DC Ammeter (0-5A) WITH POLARITY PROTECTION DIODE
  - c) Field failure relay to control Armature supply.
  - d) 4A Circuit Breaker.
- **Instrumentation Power supply cum Multichannel DPM panel**
  - +12 V, -12V, 500 mA
  - +5V, 300 mA
  - Line synchronizing signal.
  - Multi channel DPM for digital display of torque, speed etc.

(1) **Resistive Load**

AC Resistors

10K/5K/3.5K/2.5K/2K/1.5K/OFF

200W x 3 phases/ 6 taps

DC Resistors

750E/600E/300E/212E/162E/125E/112E/100E/400W /8 taps+OFF+separate 60E tap for DC series Gen.

(2) **LC Load panel**

Inductive load= 0.15H/0.3H/0.45H/0.6H/0.75H/1.5H/3H/400mA X3 Nos.

Capacitive load= 1.25µF/2.5µF/5µF/415VX3Nos.

Variable AC & DC Supply Panel

- Variable O/P : AC 0-270V/3A
- Variable O/P : DC 0-250V/3A

B) Electrical Machine Units Offered:

1. DC Integrated (Trunion Mounted) Machine

- **Voltage :** Varm= 180V Vfield = 180V
- **Capacity/RPM /Terminals:** 300W/4 Pole m/c / 1500RPM 6 terminals
- **Rotor Construction:** Standard commutator /brush arrangement with laminated stack, brought out on 2 terminals
- **Stator construction:** Separately excited field winding with laminated solid yoke and series winding brought out on 4 terminals.
- **Winding Temp.:** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Toque Speed Characteristic:** Provision of load cells Minimum 5 kg. 2 No. & speed sensor assembly to measure the torque speed.
- **Frame/ Mounting Shaft dia:** Minimum 100 Frame, Chais with handle clamps to easy coupling two motors

➢ **Experiments Covered:**

- **I) Motors** 1) Speed torque curves of a) Shunt motor
- b) DC series motor
- c) Separately excited DC motor
- d) DC compound motor (Cumulative & Differential)
- **II) Generator (Needs to be driven)**
- 1) V-I, Efficiency curves for a) C Shunt generator
- b) DC series generator
- c) DC separately excited generator
- d) DC compound generator
- **2) Armature resistance Starter & SCR based soft start mechanism**
- **3) Efficiency of all above DC m/c**

2. 3 Phase AC Integrated Machine

- **Voltage :** 415VAC, 50Hz
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c / 1500RPM 10 terminals

- **Rotor Construction:** Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft.
- **Stator construction:** Six terminals to be brought out to start the machine using STAR-DELTA starter.
- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia :** Minimum 100 Frame, Chasis mounted 19mm dia. With easily swappable gear coupling

  - **Experiment Covered: I) Motors**
- a) Speed torque curves of wound rotor induction motor with rotor shorted & with different rotor resistors
- b) DOL/Star-Delta starters, rotor resistance Slater
- c) Application of sync. Motor as power factor improvement device / V Curve.
- **II] Generator (Needs to be driven)**
- a) Synchronous generators V-I curve of sync generator.
- **III) Efficiency of all above 3 phase AC machines.**

3. <u>3 Phase Salient Pole Alternator</u>

- **Voltage :** 415VAC, 50Hz
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c / 1500RPM
- **Rotor Construction:** Star connected, four terminals including star point brought out on 4 slip rings mounted on shaft.
- **Stator construction :** Separately excited field winding with laminated solid yoke, 4 pole brought out on 2 terminals
- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia :** 100 Frame, Chasis mounted 19mm dia. With easily swappable gear coupling

  - **Experiments Covered : I) Motors** a) Speed torque curves of salient pole motor.
- b) Use of synchronous motor as power factor improvement device. Study of V curves.
- c) Regulation of 3 phase alternator by i) Synchronous Impedance Method
- ii) ZPF or POTIER Method iii) Actual Load Test d) Determination of sequence components Z0, Z1, Z2. e) Direct axis & quadrature axis substracter X01. g) Negative sequence Reactance X2.
- **II)** Comparing experiments fault current with calculated fault current using Z0, Z1, Z2.

4. <u>1 Phase Synchronous machine</u>

- **Voltage :** 230 VAC, 50Hz
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c /1500RPM 4 terminals
- **Rotor Construction:** Single phase wound rotor with terminals brought out on two slip rings mounted on shaft.
- **Stator construction :** One winding will be used to configure synchronous motor & Alternator output when used as single phase generators
- **Winding Temp. :**A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.

- **Frame/ Mounting Shaft dia:** 100 Frame, Chasis mounted 19mm dia. With easily swappable gear coupling

➢ **Experiments Covered:**

I] Motors

a) Speed torque curves of sync. motor. **b) V curve**

- **II] Generator (Needs to be driven)** a) V-I curves of sync. single phase generator with excitation at rotor slip rings.
- **III] Efficiency** of all above single phase AC Gen. & Sync. Motor.

5. <u>1 Phase AC Integrated Motor</u>

- **Voltage :** 230 VAC, 50Hz
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c /1500RPM 10 terminals
- **Rotor Construction :** Die cast Squirrel cage motor
- **Stator construction:** Two windings brought out on 4 terminals for main and auxilliary. These will be used to configure different motors Split phase, CSCR, CSIR.
- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia :** Minimum 100 Frame, Chasis mounted 19mm dia. With easily swappable gear coupling

➢ **Experiments Covered:**

I) Motors a) Speed torque curves of split phase induction motor. b) Speed torque curves of CSIR C) Speed torque curves of CSCR.

6. <u>Universal Motor</u>

- **Voltage :** 230 VAC, 50Hz **/** 150VDC
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c /1500RPM 4 terminals
- **Rotor Construction :** Standard commutator brush arrangement brought out on 2 terminals
- **Stator construction:** Stator brought out on 2 terminals to facilitate AC/DC operation and direction change. Built in compensating winding to minimize AR and sparking.
- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia:** 100 Frame, Chassis mounted 19mm dia. with easily swappable gear coupling**.**

➢ **Experiments Covered :**

Speed- torque curves of universal motor when operated with a) 220/240VAC b) 180VDC

7. <u>Repulsion Motor</u>

- **Voltage :** 230 VAC, 50Hz
- **Capacity/RPM /Terminals:** 300W/4 Pole m/c /1500RPM 2 terminals
- **Rotor Construction:** Standard commulator brush but short circuited.
- **Stator construction:** Stator brought out on 2 terminals. Settable handle to rotate brush position w.r.t. Neutral axis.

- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia:** 100 Frame, Chasis mounted 19mm dia. with gear coupling.

➢ **Experiments Covered:**

Motors

a) Speed torque curves.

b) Speed control and reversal with brush setting using handle to rotate brush position w.r.t. Neutral axis.

8. <u>3 Phase Squirrel Cage Induction Motor</u>

- **Voltage :** 415 VAC, 50Hz
- **Capacity/RPM /Terminals :** 300W/4 Pole m/c /1500RPM 12 terminals
- **Rotor Construction :** Diecast Squirrel cage motor
- **Stator construction:** 6x2 terminals brought out to run machine at two speeds using pole changing method.
- **Winding Temp. :** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.
- **Frame/ Mounting Shaft dia :** 100 Frame, Chasis mounted 19mm dia. with easily swappable gear coupling.

➢ **Experiments Covered:**

I) Motors

a) Speed torque curves of squirrel cage rotor induction motor at two speeds.

b) DOL/Star-Delta/Pole change starters**)** Efficiency of 3 phase AC Squirrel cage motor.

III) Induction Generator: Torque -Speed curve in both motor as well as generator mode. Needs EMT-34 (3 phase Bidirectional Power cum Energy Meter Panel)

9. <u>DC Integrated (Foot mounted) Machine</u>

- **Voltage:** Varm= 180V Vfield = 180V
- **Capacity/RPM /Terminals:** 300W/2 Pole m/c /1500RPM 6 terminals
- **Rotor Construction:** Standard commutator / brush arrangement with laminated stack, brought out on 2 terminals
- **Stator construction:** Separately excited field winding with laminated solid yoke 2 pole and series winding brought out on 4 terminals.
- **Winding Temp.:** A embedded Thermistor brought out on 2 eyelets mounted on terminal box for monitoring winding temperature.

➢ **Experiment Covered:**

1) Hopkinson's Test

2) Swinburne's test

3) Motors – Speed torque curves of a) Shunt motor b) DC series motor c) Separately excited DC motor d) DC compound motor (Cumulative & Differential)

4) Generator (Needs to be driven) V-I, Efficiency curves for a) C Shunt generator b) DC series generator c) DC separately excited generator d) DC compound generator

5) Armature resistance Starter & SCR based soft start mechanism

6) Efficiency of all above DC m/c.

Accessories: 1) Patch Cords Set 2) 20E/200W Rheostat as per the need is required.

Note:

- With due emphasis on student safety machines operate upto 300W power levels and up-to 1500/3000RPM. Able to draw all graphs.
- Trunnion mounted DC integrated machine is required as Dynamometer for loading other machines (Motors/generators both); with facility to measure shaft power using electronic torque / speed measurement.
- Aluminum profile sturdy Modular flat panel (table top) system, carrying various high voltage components housed in plastic enclosures (panel) to minimize shock possibility.
- Easy and safe wiring for students, use of 4 mm sturdy **Shrouded** banana patch cords and shrouded socket arrangements.
- All machines are mounted on finely painted sturdy base frame with easy machine interchangeability.
- Use of gear coupling facilitates screw-less coupling.
- At the time of installation all experiments will be performed with clear demonstration.
- Manual of each experiment with neat connection diagram and steps is required.
- Technical assistance of the complete panel for at least for 3 years is required.

FORMAT FOR QUOTATION SUBMISSION
(In letterhead of the supplier with seal)

Date: _____

To:_____
_____

Sl. No.	Description of goods \ (with full Specifications)	Qty.	Unit	Quoted Unit rate in Rs. (Including Ex-Factory price, excise duty, packing and forwarding, transportation, insurance, other local costs incidental to delivery and warranty/ guaranty commitments)	Total Price (A)	Sales tax and other taxes payable	
						In %	In figures (B)
Total Cost							

Gross Total Cost (A+B): Rs. _____

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs. ———————— (Amount in figures) (Rupees ————————amount in words) within the period specified in the Invitation for Quotations.
We confirm that the normal commercial warranty/ guarantee of ———————— months shall apply to the offered items and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.
We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Signature of Supplier
Name: _____
Address: _____
Contact No. _____