

INDIAN INSTITUTE OF TECHNOLOGY GOA

At Goa Engineering College Campus

Farmagudi, Ponda, Goa 403401

E-mail: purchase@iitgoa.ac.in

GSTIN: 30AABAI1653D1ZF

PAN: AABAI1653D

TAN: BLRI08261B

Enquiry No: IITGOA/2018-19/104

Date: 13/02/2019

IIT Goa invites sealed quotations in two bid form for the supply of below mentioned item.

Sl. No.	Description of Item	Qty.
1	Setting up & Installation of Electrical Machines Lab (Detailed Specifications Attached)	01 No.

Terms and conditions:

1. Quotation must be valid for at least 90 days.
2. The GSTIN should invariably be mentioned in your offer.
3. Supplier should provide free delivery and installation at IIT Goa.
4. The Bidder must be an Original Equipment Manufacturer (OEM) or his Authorized Dealer/Authorized Distributor/ Authorized Stockist/ Channel Partner having a Direct Purchase and Support agreement with the OEM. In case, if the Bidder is a Dealer/Distributor, a valid LETTER OF AUTHORIZATION from the Original Equipment Manufacturer for Dealership should be produced.
5. The Average Annual Turnover of the Bidder for the last three years should be at least Rs.25 lacs. (Rupees Twenty-Five lacs). A Printed copy of the Annual Accounts duly audited and certified by the Chartered Accountants must be enclosed with the technical bid.
6. The Bidder should provide at least five list of customers of previous supply of a similar/ same range of equipment to IIT's / NIT's / Universities with contact details. Copies of orders received from the reputed firms on bidding firm need to be submitted.
7. The Bidder should furnish minimum two satisfactory performance certificate from the parties concerned to whom supplies were affected in case such supplies were made.
8. The Successful bidder shall provide minimum three years warranty after the completion of installation.
9. The bidder should produce the Certificate of Incorporation of the organization.
10. Certificate/Undertaking on the letterhead of the Company to the effect that the bidder/ Manufacturer had not been blacklisted anywhere in India or abroad by any organization.
11. Kindly attach a compliance certificate along with the technical quote.

12. Prices:

I) For Import Supplies:

- a) It is mandatory to quote price in CIF/CIP Goa basis only with separate cost breakup.
- b) In case of Multiple options of same product, bidders are requested to quote only one best option and not multiple options.
- c) All local taxes, customs duty and clearance charges will be borne by the Institute as applicable.
- d) Payment terms: 90% payment by letter of credit and balance 10% will be paid by wire transfer after satisfactory installation and commissioning.

II) For Indigenous Supplies:

- a) In case of Multiple options of same product, bidders are requested to quote only one best option and not multiple options.
- b) Payment terms: Within 30 days after the delivery and installation of the item at IIT GOA.

13. Delivery and installation should be made within 4-6 weeks of getting a confirmed order.

14. The suppliers shall provide the banking details along with their quote on their letterhead duly signed and stamped.

15. IIT Goa reserves the right to accept and/or reject any/all bids without assigning any reason.

16. Quotations shall be submitted in two parts;

- 1) **Part – I (Technical)** should contain all the technical details and specification of the product. It should contain unpriced bid along with terms and conditions, compliance certificates, proprietary certificates (if applicable), any other certificates/details etc. This envelope should be marked as “Technical Bid”
- 2) **Part -II (Financial)** The financial bid of the above item should be in a sealed envelope marked as “Financial Bid” and should contain financial terms and conditions.

17. For any clarification, you may kindly contact Dr. Sashidhar Sampathirao (e-mail: ssd@iitgoa.ac.in) and Stores & Purchase Department (email: purchase@iitgoa.ac.in) till 22/02/2019.

18. All sealed quotations must reach to the Assistant Registrar (Stores & Purchase), IIT Goa, at Goa College of Engineering Campus, Farmagudi, Ponda, Goa by 17.00 Hrs on or before 06th March, 2019”.

Sd/-

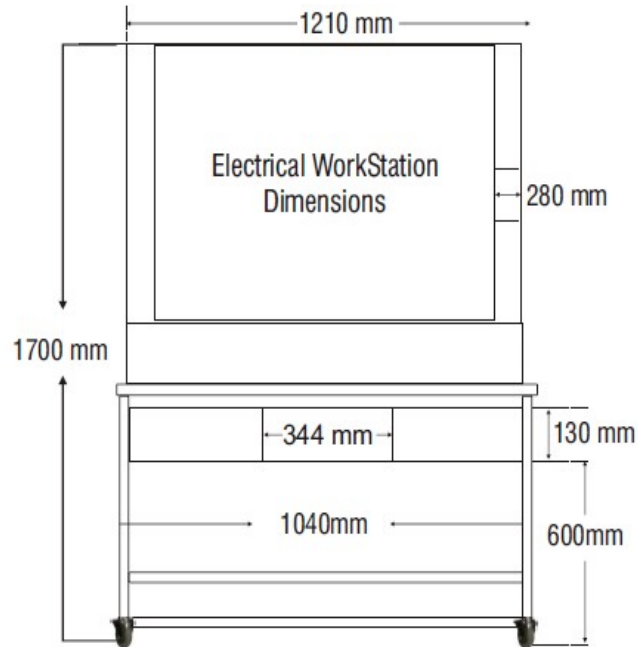
Asst. Registrar (S&P)

Establishment of Electrical Machines Laboratory

IIT Goa

S.No.	Name of the Electrical Machines Workbench	Quantity required
1	Single-phase Transformer workbench	1
2	DC Shunt Motor workbench	2
3	DC Shunt Generator and Motor workbench	2
4	Induction Motor workbench	2
5	Synchronous Generator and Motor workbench	1
6	Cut-Sections of Machines workbench	1
7	Single/Three Phase Resistive Load	3
8	Single/Three Phase Inductive Load	1
9	Single/Three Phase Capacitive Load	2
10	DC Supply	4
11	AC/DC Load	8
12	Single-Phase Variac	3
13	Three-Phase Variac	3
14	Rheostats	20

The maximum dimensions of each of the above ELECTRICAL WORKBENCH/WORKSTATION are given below:



Technical Details of Electrical Machines Lab

1) Single Phase Transformer Workbench - 01 No.

Setup should have following key features:

- Control board consisting of high grade FRP material for better safety
- Rust free powder coated front Panel
- Inbuilt Single Phase Variac
- Flexibility to configure Step-up, Step-down and Isolation Transformer
- Micro-controller based digital meters
- BS10 terminals and specially designed patch cords to protect from danger.
- Equipped with Supply Indication Lamp , facility to use Fixed and Variable Load
- Diagrammatic representation for the ease of connections
- Provided with suitable protection such as fuses, MCB, earthing provision

Technical Details:

Mains Supply : Single Phase, 230V AC \pm 10%, 50Hz

Single Phase Transformer

Rating : 1kVA

Primary Voltage : 0-125V, 0-125V

Secondary Voltage : 0-125V, 0-125V

Rated Current : 4A

Single Phase Auto Transformer

Primary Voltage : 230V

Secondary Voltage : 0-270V

Rated Current : 4A

Digital Meters Used

AC Voltmeter : 10A (2Nos.)

AC Ammeter : 450V (2Nos.)

Wattmeter : 4500W

MCB (SP) : 6A

AC / DC Load : 1.2kW

Scope of learning

- Study of Transformation Ratio in a Single Phase Transformer
- Study of Polarity Test in a Single Phase Transformer
- Study of Open Circuit Test in a Single Phase Transformer
- Study of Short Circuit Test in a Single Phase Transformer
- Study of Load Test and correspondingly determine the Efficiency and Voltage Regulation in a Single Phase Transformer

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white color mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness. MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provide

2) DC Shunt Motor Workbench – 02 No.

Setup should have following key features:

- Control board consisting of high grade FRP material for better safety
- Rust free powder coated front panel
- Micro-controller based digital meters
- Machine with Mechanical Loading Arrangement
- Setup should be provided with Digital Tachometer
- Machine with Class “B” Insulation
- Machine fitted with heavy duty channel
- Diagrammatic representation for the ease of connections and student can easily understand the concept of machine.
- Provided with sliding type rheostat for speed control of machine (connected externally)
- Field failure and over current protection (with provided DC Power Supply)
- Suitable to run in self and separately mode of machine (with provided DC Power Supply)
- Provided with suitable protection such as fuses, earthling provision
- BS 10 terminals and specially designed patch cords to protect from danger.
- Love-joy type (or similar) coupling

Technical Details:

Type	: Shunt
Power Rating	: 2HP
Voltage Rating	: 230V ± 10%
Rated Speed	: 1500RPM ± 7.5%
Insulation	: Class 'B'
Spring Balance	: 2 Nos. (Tubular Type)
Brake Drum/Pulley	: Aluminum casted with heat suppression Facility
Machine Base	: “C” Channel
Protection	: Fuses (mounted at the terminal box of the Machines)

Digital meters

DC Ammeter	: 20A (2Nos)
DC Voltmeter	: 300V (1Nos.)

DC Power Supply

DC Output Voltage

Fixed	: 220V ± 10%, 2A
Variable	: 0-220V ± 10%, 12A
Rheostat	: 220 Ohm, 2.8A
Rheostat	: 110 Ohm, 5A
Three Point starter	

Scope of learning

- Speed Control of DC Shunt Motor by Field Current control and Armature Voltage Control method
- Load Characteristics of DC Shunt Motor
- N-I Characteristics of DC Shunt Motor
- N-V Characteristics of DC Shunt Motor
- Study of self-excited DC Shunt Motor

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white colour mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness. MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provided
- Machine to be fixed on ground with vibration pad provided and to be fixed below the table

3) DC Shunt Generator and Motor workbench – 02 No.

Setup should have following key features:

- Control board consisting of high grade FRP material for better safety
- Rust free Powder coated front panel
- Micro-controller based digital meters
- Machine with Electrical Loading Arrangement
- Setup should have provided with Digital Tachometer
- Machine with Class “B” Insulation
- Machine fitted with heavy duty channel
- Standard Lovejoy Coupler to couple machines
- Diagrammatic representation for the ease of connections and student can easily understand the concept of machine.
- Provided with sliding type rheostat for speed control of machine (connected externally)
- Provided with 3.5kW resistive load to be compatible with single phase, three phase and dc supply
- Field failure and over current protection (with provided DC Power Supply)
- Suitable to run in self and separately mode of machine (with provided DC Power Supply)
- Provided with suitable protection such as fuses, earthling provision
- BS 10 terminals and specially designed patch cords to protect from danger.
- Love-joy type (or similar) coupling

Technical Details:

Both the Machines should be flexibly coupled and mounted on a Single 'C' Channel Base

Type	: Shunt
Power Rating	: 2HP
Voltage Rating	: 230V \pm 10%
Rated Speed	: 1500RPM \pm 7.5%
Insulation	: Class 'B'
DC Machine (acts as generator)	
Type	: Shunt
Power Rating	: 2HP
Voltage Generated Rating	: 220V \pm 10%
Rated Speed	: 1500RPM \pm 7.5%
Insulation	: Class 'B'
Loading Arrangement	: Electrical
Type of Coupling	: Flexible "Lovejoy" Coupling
Machine Base	: "C" Channel
Protection	: Fuses (mounted at the terminal box of the Machines)

Digital meters

DC Ammeter	: 20A (4Nos)
DC Voltmeter	: 300V (2Nos.)

Resistive Load : 3.5kW

DC Power Supply**DC Output Voltage**

Fixed	: 220V \pm 10%, 2A
Variable	: 0-220V \pm 10%, 12A

Rheostat : 300Ohm, 0.8A

Rheostat : 110Ohm, 5A

Three Point Starter**Scope of learning**

- Study of No Load Characteristics of Separately Excited DC Shunt Generator
- Study of Load Characteristics of Separately Excited DC Shunt Generator

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white colour mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness. MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provided
- Machine to be fixed on ground with vibration pad provided and to be fixed below the table

4) Induction Motor Workbench – 02 No.

Setup should have following key features:

- Control board consisting of high grade FRP material for better safety
- Rust free Powder coated front Panel
- Micro-controller based highly accurate digital meters
- Setup should have provided with Digital Tachometer
- Machine have CE Marking.
- Machine fitted with heavy duty channel with mechanical loading arrangements and Aluminum casted Brake-Drum/Pulley arrangements for heat suppression
- Equipped with supply indication lamps
- Good quality spring balance with durable at the same time and accurate result
- Diagrammatic representation for the ease of connections and student can easily understand the concept of machine.
- Provided with suitable protection such as fuses, MCB, earthing provision
- BS 10 terminals and specially designed patch cords to protect from danger.
- Love-joy (or similar) type of coupling

Technical Details:

Type	: Three Phase Squirrel Cage Induction Motor
Make	: Havells/Crompton/Kirloskar/Siemens/ABB
Power Rating	: 2HP
Voltage Rating	: 415V AC \pm 5%, 50Hz
Rated Speed	: 1440RPM \pm 7.5%
Insulation	: Class 'F'
Loading arrangement	: Mechanical
Spring Balance	: 2 Nos. (Tubular Type)
Brake Drum/Pulley	: Aluminum casted with heat suppression Facility
Machine Base	: "C" Channel
Protection	: Fuses (mounted at the terminal box of the Machines)

Measuring Unit

Voltmeter	: 500V (1No.)
Ammeter	: 10A (1No.)
Wattmeter	: 4500W (2Nos.)

Protection Unit

MCB	: 10A
Three Phase Variac	: 10A, Closed Type (connected externally)

Scope of learning

- Study of Running and Reversing of Three Phase Induction Motor
- Study of No Load Test performed in a Three Phase Induction Motor
- Study of Block Rotor Test performed in a Three Phase Induction Motor, Measurement of Slip in a Three Phase Induction Motor
- Study of Speed-Torque characteristics in a Three Phase Induction Motor

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white colour mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness.
- MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provided
- Machine to be fixed on ground with Vibration Pad provided and to be fixed below the table

5) Synchronous Generator and Motor Workbench - 01 No.

Setup should have following key features:

- Control board consist of high grade FRP material for better safety
- Rust free Powder coated Front panel
- Machine with Electrical Loading Arrangement
- Micro-controller based digital meters
- Setup should have provided with Digital Tachometer
- Machine with Class “B” Insulation
- Machine fitted with heavy duty channel
- Standard Lovejoy Coupler to couple machines
- Diagrammatic representation for the ease of connections and student can easily understand the concept of machine.
- Provided with suitable protection such as fuses, earthling provision
- BS 10 terminals and specially designed patch cords to protect from danger.
- Love-joy (or similar) type of coupling

Technical Details:

Both the Machines should be flexibly coupled and mounted on a Single 'C' Channel Base
Three Phase Synchronous Motor

Type	: Salient Type
Power Rating	: 3 HP
Generated Voltage	: 415V AC \pm 10%, 50Hz
Configuration	: “Delta” Connected
Rated Speed	: 1500RPM \pm 5%
Insulation	: Class 'B'
Excitation Voltage	: 120VDC

Three Phase Synchronous Generator

Type	: Salient Type
Power Rating	: 3 HP
Generated Voltage	: 415V AC \pm 10%, 50Hz
Configuration	: “Star/Delta” Connected
Rated Speed	: 1500RPM \pm 5%
Loading Arrangement	: Electrical
Type of Coupling	: Flexible “Lovejoy” Coupling
Machine Base	: “C” Channel

Protection : Fuses (mounted at the terminal box of the Machines)

Digital meters

DC Ammeter : 20A (1Nos.)
AC Ammeter : 10A (1No.)
AC Voltmeter : 500V (1No.)
DC Voltmeter : 300V (1No.)
Wattmeter : 4.5kW (2Nos.)

DC Power Supply

DC Output Voltage

Fixed : 220V \pm 10%, 2A
Variable : 0-220V \pm 10%, 12A
Rheostat : 220Ohm, 2.8A

10A, Closed Type three phase autotransformer

Scope of learning

- To study the V Curve and Inverse V curve of the Three Phase Synchronous Motor at no load condition
- Study of Speed-Torque and other performance characteristics of a Three Phase Synchronous Motor
- Synchronization of two Three Phase Alternators by
 - Synchronoscope method
 - Three dark lamp method
 - Two bright one dark lamp method
- Regulation of Three Phase Alternator by
 - Open Circuit test
 - Short Circuit test

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white color mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness.
- MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provided
- Machine to be fixed on ground with Vibration Pad provided and to be fixed below the table

6) Cut Sections of Motors – 01 No. each

Features

- Self-Contained
- Easy to operate
- Quality designed motor with running condition
- Easily distinguish the internal part of machines
- Provided with terminal box for ease of connection
- Online product tutorial

Technical Specifications

Rating	Type of Machines
1 HP	DC Shunt
1 HP	3-Phase AC Squirrel Cage Induction
3 HP	3-Phase AC Slip Ring Induction
1 HP	3-Phase Synchronous

Mandatory Accessories

DC Supply

DC Output Voltage

Fixed : 220V \pm 10%, 2A

Variable : 0-220V \pm 10%, 12A

10A, Single Phase Variac, Closed Type

10A, Three Phase Variac, Closed Type

Bench Specifications

- Structure of workbench should be made up of 1.5 mm thick CRC powder coated pipes with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white color mica.
- The bench working area should be covered by 2 mm thick antistatic mat which help students to controls static discharge as static cause interference or damage to students.
- The basic structure should be made of 38 x 38 x 1.5 mm CRC powder coated pipes for sturdiness.
- MS drawers 03 numbers 415X290X133 mm (H X W X D) and thickness 1.2mm with handle & separate lock on each drawer should be provided
- Machine to be fixed on ground with Vibration Pad provided and to be fixed below the table

7) Single/ Three Phase Resistive Load bank – 03 No

Resistance values in 5 steps per phase

Phase Voltage 240 V at 50 Hz

Range of Phase Current 1 – 5 A (per phase)

15 Amp for Single Phase and 5 Amp Each Phase

8) Single/ Three Phase Inductive Load Bank – 01 No

Suitable for loading Single Phase and Three Phase supply

Suitable for both static & rotating machines

MCBs to be used to switch values and provide protection at the same time

Heavy duty wheel for easy movement

Suitable for balanced and unbalanced loading conditions

Designed by considering all the safety precautions

9) Single/ Three Phase Inductive Load Bank – 01 No

Used in single or three phase load

Ten selectable load values on each bank
in-build star / Delta switch
Work as a balanced or unbalanced load in three phase circuits
Totally independent banks to all allow connection as a star or delta load
Setup should include:-
Current : 4.6 A each phase (in star connection)
13 A each phase (in Delta Connection)

10) DC Power supply for different workbenches

a) DC Power Supply – 2 No

Mains Supply: 230V $\pm 10\%$, 50Hz
DC Output
Voltage Variable: 0-200V Fixed: 200V
Transformer Rating: 2kVA
Primary Voltage: 0-230V Secondary Voltage: 0-150V,
Meters to be used: Voltmeter : 300V
Ammeter : 10A, Auto Transformer: 270V, 10A
MCB: 10A

b) DC Power supply – 1 No

Input Mains: 230V AC $\pm 10\%$, 50Hz
DC Output Voltage Fixed: 220V $\pm 10\%$, 2A
Variable: 0-220V $\pm 10\%$, 12A
Digital Voltmeter: 300V
Digital Ammeter: 20A
Single Phase MCB: 20A
Over Current protection; Suitable to run in series and shunt mode of machine
Low cost thyristor based design: Separate section for Fixed and Variable Supply

c) DC Power Supply – 1 No

Input Mains: 230V AC $\pm 10\%$, 50Hz
DC Output Voltage Fixed: 220V $\pm 10\%$, 2A
Variable: 220V $\pm 10\%$, 25A
Meter to be used: Voltmeter: 1 no Ammeter: 1 no
Single Phase MCB: 1 no
Over Current protection; Field failure protection with indicating lamp
Low cost thyristor based design; Separate section for Fixed and Variable Supply

11) AC/DC Load – 08 No

Panel with following items on board
a. Switches to control the load - 12 Nos.
b. Ammeter - 1No.
Mains Supply: AC / DC, 230 V $\pm 10\%$
Load Range: 0 - 1.2 kW, in steps of 100 W
Load Type: Resistive (Lamp Load)
Ammeter (MI): 10 A

12) Single Phase Variac – 03 No

Type: Close Type
Operating Rating: 230V AC $\pm 10\%$, 50Hz
Output Voltage: 0 - 270V AC $\pm 10\%$, 50Hz
Current: 10A

13) Three Phase Variac – 3 No

Type: Close Type
Operating Rating: 415V AC $\pm 10\%$, 50Hz
Output Voltage: 0 - 470V AC $\pm 10\%$, 50Hz
Current: 10A

14) Rheostats

1. 5 A, 110 ohm Rheostat -5 No
2. 8 A, 100 ohm Rheostat -5 No
3. 0.8 A, 300 ohm Rheostat -5 No
4. 2.8 A, 220 ohm Rheostat-5 No

Miscellaneous Specifications:

1. All the workbenches and equipment should be installed in a space of approximately 17 m x 7 m (length x width).
2. The workbenches should/may be installed on tiled flooring and hence enough precautions are to be taken to ensure that vibrations are dampened effectively.
3. The vendor is supposed to successfully install and test all the workbenches along with the equipment in tandem.
4. One demo session is to be given after successful installation. All the standard safety and precautions should be taken care during installation.
5. All the terminals of the motors/generators/transformers should be made accessible for measurement of parameters like current/voltage/power, etc though external voltage/current probes for display on oscilloscopes.
6. The connections from the panels for measurement of various parameters should be preferably of patch cord type.