|  |  |  |
| --- | --- | --- |
|  | **PAKISTAN INDUSTRIAL TECHNICAL ASSISTANCE CENTRE (PITAC)**  **234 – Ferozepur Road Lahore – 54600**  **PABX:042-99230702,99230699 FAX:042-99230589**  **Email: info@pitac.gov.pk** [**URL:www.pitac.gov.pk**](file:///C:\Users\anwarhaq\Desktop\www.pitac.gov.pk) | Description: Emblem_PakistanMinistry of Industries & Production |

**TENDER DOCUMENT NO.389/2020OF TENDER FORM RS 0/-)**

Issue Date: **04-12-2020** Closing Date: **21-12-2020 (11:00 AM)**

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **LIST OF MODULE AND ATTACHMENTS** | **Qty.** |
| 01 | AC Machine Lab Trainer | 01 |
|  | Universal Power Supply, Single Phase Transformer, Three Phase |  |
|  | Transformer, Three Phase Squirrel Cage Motor, Three Phase Slip Ring |  |
|  | Asynchronous Motor, Asynchronous Machine 2/4 Pole Windings, Three |  |
|  | Phase Synchronous Motor/Generator, Universal Motor, Torque and Speed |  |
|  | Meter, Starter Rheostat for Slip Ring and Cage Three-Phase Motor, |  |
|  | Resistance Load, Capacitive Load, Inductive Load, Couplings and Rubber |  |
|  | Sleeve, Single Phase Analyzer, Three Phase Analyzer, Standard Set of |  |
|  | Patch Leads, Synchronizing Device |  |

**Specifications of AC Machines LAB Trainer**

**Universal Power Supply**

* Circuit breaker protection
* Earth leakage breakers
* Isolation transformer
* Input: 3-phase 400V (3P+N+T)
* Output Three phase nominally 0 - 400V AC line at 4A
* Output Single Phase nominally 0 - 230V AC line to neutral at 4A
* Output DC nominally VR(0 - 270V) at 6A
* Fixed output: Three Phase 400V line, 230V Single Phase, DC 220V/10A
* Safety earth connection provided
* Connects via 4mm safety sockets
* Voltmeter & Ammeter
* Emergency Pushbutton
* Mains Lamp

**Single Phase Transformer**

* Multi-windings for series and parallel connection
* Primaries: 2 x 110V windings
* Secondary’s: 2 x 55V windings
* Power rating 300VA
* Frame or bench mounting
* Safety earth connection provided
* Connects via 4mm safety sockets

**Three Phase Transformer**

* + Primaries/secondary’s for Star or Delta connection
* 2 x 110V primaries per phase
* 2 x 66,5V secondary’s per phase
* Power rating 300VA
* Frame or bench mounting
* Safety earth connection provided
* Connects via 4mm safety sockets

**Three Phase Squirrel Cage Motor**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Dual voltage machine, 380/415V, Star, 220/240V Delta
* Safety earth connection provided
* Connects via 4mm safety sockets

**Three Phase Slip Ring Asynchronous Motor**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Nominal voltage: 220/380/400V (delta/star) / 50Hz;
* Safety earth connection provided
* Connects via 4mm safety sockets

**Asynchronous Machine 2/4 Pole Windings**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Nominal voltage: 220/230/400V, 50Hz;
* Number of stator windings: 3;
* Number of stator connections: 3;
* Safety earth connection provided
* Connects via 4mm safety sockets

**Three Phase Synchronous Motor/Generator**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Can be used as a motor or generator
* Rated at 415/240V 200W
* Power Requirement 380/415V Three Phase AC star or 220/240V delta
* Nominal rotor supply 100V DC
* Safety earth connection provided
* Connects via 4mm safety sockets

**Universal Motor**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Rated at 250 W continuous
* Power Requirement 220V DC or Single Phase AC 50Hz supply
* Double ended shaft with 12mm diameter
* Safety earth connection provided
* Connects via 4mm safety sockets

**Repulsion Motor**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* Modularity and expansions over time
* Metal housing with internal connections explained by a clear synoptic
* Rated at 250 W continuous
* Power Requirement Single Phase AC 50Hz supply
* Safety earth connection provided
* Connects via 4mm safety sockets

**Torque and Speed Meter**

* Provides manual control of torque and speed
* Constant torque and torque proportional with speed controls
* Digital display for speed or torque
* Speed range ±5000rpm.
* Torque range up to 100Nm
* Supply 220-240V AC at 5A, 50/60Hz
* Frame or bench mounting

**Starter Rheostat for Slip Ring and Cage Three-Phase Motor**

* Resistance: 3 x 0-50 ohm
* Rated current: 3 x 3.1A
* Max. cont. load: 3 x 320W
* Safety earth connection provided
* Connects via 4mm safety sockets

**Resistance Load**

* Three resistor switched load banks
* Seven resistor values per bank
* DC and single-phase 240V mode
* Three-phase delta 240V/three-phase star 400V, 300 watts
* Fuse protected at 0.5A
* Safety earth connection provided
* Connects via 4mm safety sockets

**Capacitive Load**

* Three capacitive switched load banks
* Seven capacitive values per bank
* Single-phase 240V mode
* Three-phase delta 240V/three-phase star 400V, 300 watts
* Fuse protected at 0.8A per bank
* Safety earth connection provided
* Connects via 4mm safety sockets

**Inductive Load**

* Three inductive switched load banks
* Seven inductive values per bank
* Single-phase 240V mode
* Three-phase delta 240V/three-phase star 400V, 300 watts
* Fuse protected at 0.5A per bank
* Safety earth connection provided
* Connects via 4mm safety sockets

**Couplings and Rubber Sleeve**

* Complete set of spare part:
* Nr. 02 Coupling A945:
* Internal diameter:
* External diameter
* Length:

**Single Phase Analyzer**

* Measurement: Voltage, Current, Frequency, Active Power, Reactive Power and
* Power Factor
* Supply: Single Phase from the mains
* Display: 7-Segment LED
* Measurement ranges:
* Volt: 0-600V
* Current: 5/1A via CT
* Frequency ranges:
* Active Power: 50/60 Hz
* Reactive Power: 50/60 Hz

**Three Phase Analyzer**

* Measurement: Voltage, Current, Frequency, Active Power, Reactive Power and Power Factor
* Supply: Single Phase from the mains
* Display: 7-Segment LED
* Measurement ranges:
* Volt: 0-600V
* Current: 5/1A via CT
* Frequency ranges:
* Active Power: 50/60 Hz
* Reactive Power: 50/60 Hz

**Standard Set of Patch Leads**

* The set consists of 50 leads in 3 different coded colors and lengths chosen to allow the realization of all experiments.
* Leads are capable of 15A current intensity and are terminated on banana-banana plugs.

**Synchronizing Device**

* High level of electrical and mechanical safety
* Quick and easy coupling with other machines in the same series
* 3 Phase 400VAC, 5A
* Two Voltmeters, Two frequency meters
* Dark/bright lamp Method

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **List of Experiments.** | **Qty.** |
|  | **AC Machines Lab Trainer:**  (100-746 Watt). Power Approx.)  Capable of performing following Practical’s / experiments.  Different connections of 3-ph motor, Efficiency of 3-ph motor, Synchronous Generator (Operation effect of speed of frequency, open and short circuit tests, voltage regulation, Parallel operation, Sharing of Loads, Measurement of power angle by changing Lords).Asynchronous& Synchronous motor (starting with various methods, Effect of excitation, Torque angle measurements)  AC Generators,  Voltage, current and frequency measurements,  Resistance, inductance, capacitance measurements. Active power, reactive power and power factor, Measurements torque and angular speed measurements,  Dark Lamp Method, Bright Lamp Method,  No load, load and short circuit characteristics of , Synchronous, asynchronous, transformers and special Machine, measurement on single phase active power and Power factor detection frequency, capacitance, Inductance measurements  Sequence determination with sequence scope,  Three phase active power, sequence detection & reactive power determination  Three phase active power on symmetrical and balanced Load with single phase watt meter and simulated or real Star point, reactive power measurement of single phase.  Reactive power in three phase symmetrical and balanced System  Power factor measurement in single phase and in three phase alternator measurement with ohmic, inductive, capacitive load. Parallel connection of two alternators.  Synchronous motor measurement, operation of machine With unitary lag and lead power factor.  Three phase asynchronous motor with squirrel cage rotor measurements.  Measurements on three phase asynchronous ring motor, Starting and speed control of motor with wound rotor,  Measurements on universal motor,  Measurements on single phase, three phase transformers, Open and short circuits, Regulations.  Polarity test of single, three phase transformers.  Parallel connections of transformers. Single phase and three phase transformers with ohmic, inductive and capacitive load.  Transformation ratio of transformers.  Star / delta connection, T connection of three phase transformer.  Complete in all respect with power supply, auxiliary  Machines, instruments, cables instructional manual  Experiments manual and standard  Accessories etc. power supply : 230 VAC / 400 VAC, 50 HZ | 01 |

**Terms & Conditions are mentioned in Tender Notice.**

**SIGNATURE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**NAME STAMP OF BIDDERS \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**