

**Indian Institute of Technology Delhi**  
**Electrical Engineering Department**

25-10-2013.

**Sub: NIQ for Process Control Trainer with PID Unit and Function Generator.**

On behalf of duly constituted purchase committee, sealed quotations are invited from the OEMs & Authorized dealers for **Process Control Trainer with PID Unit and Function Generator** as per specifications given below.

The Thermal Process Control Trainer should be composed of the following components.

**1. Process Control Trainer System:**

The trainer system should provide for study of a thermal process and should have provision of PID control of the thermal process. It is required that there be a heater in the system for heating and a fan based cooling system housed in a tube. The trainer should be useful in performing experiments to control the temperature and airflow along the length of the tube. The following specifications should be met by the trainer system.

- Heater Power: Should be able to provide upto 80 w
- Velocity Flow Range: Should be able to provide flow rates in the range of 0.31 – 3.0 m/sec.
- Detector Temperature Range: Should be able to measure from ambient up to 80 degrees Celsius.
- Heater and Detector should have time constants not more than 400 ms.
- System should operate in an I/O range of  $\pm 10V$ .
- The system should be complete with metering and built in interfaces to connect to external controllers and recorders.
- The Setup is expected to be a miniature version to demonstrate a thermal system. Hence,
  - Tube length should be less than 12 inches.
  - Dimensions: Should be less than or equal to 52x30x22cm.

**2. PID Unit:**

The PID unit should be compatible with the process control trainer and the user should be able to use it to control the process control trainer system. The PID control unit should meet the following specifications:

1. Each path should be isolated from the others and should be accessible from monitoring sockets.
2. The three paths should be combinable with a summing amplifier.
3. The summing amplifier should have low pass filtering characteristics.
4. The unit should also provide for an inverter block.
5. All three control gains i.e., proportional, integral and derivative gain, should be tunable with the following ranges being covered.
  - Proportional Gain: Tunable with 2 range controls (0.1 - 1 and 1 – 10).
  - Integral time constant: Tunable with 2 range controls (0.1s - 1s and 1s - 10s)

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- Derivative time constant: Tunable with 2 range controls (1ms - 22ms and 10ms - 220ms)
- 6. The unit should operate with  $\pm 15V$  dc supply
- 7. The unit should weigh less than or equal to 450 grams.
- 8. The unit should have dimensions no more than 11X11X7.6cm

3. **Function Generator:** The Function Generator is a general-purpose function generator having most of the features commonly required in the testing of electronic systems:

- [1] Sine, square and triangle waveform
- [2] Frequency range 0.001Hz to 1MHz
- [3] Pushbutton selection of frequency
- [4] Main output of 20V pk to pk, 600 ohm
- [5] Switched and variable attenuation
- [6] TTL-compatible output
- [7] Continuous availability of triangle output at 2V
- [8] Voltage control of frequency (VCF)
- [9] Operates at 230V

Waveforms: Sine, square and Triangle, push button selected

Source impedance: 600 $\Omega$

Amplitude: 20V Pk-Pk open circuit

Stepped Attenuator: Five, pushbutton selectable x1.0, x0.1, x0.01, x0.001 & x0

DC Offset:  $\pm 10$  variable

Power Requirements: 230 V, 50 Hz

Weights & Dimensions: 330x118x226mm 2.2Kg.

### **Terms and Conditions:-**

1. Please submit the TECHNICAL and FINANCIAL bids in separate sealed envelopes. Mark the two envelopes clearly as **“Technical Bid”** and **“Financial Bid”**. Both the sealed envelopes should be sent in a single sealed envelope, with clearly marked as Quotation for as **“Process Control Trainer with PID Unit and Function Generator”**. The quote should reach the following address on or before **15/11/2013 up to 5.00PM**.

**Name** : Dr. M. Nabi

**Address** : Control Lab,  
Room No. II-214,

M. Nabi

**Department of Electrical Engineering,  
IIT Delhi, New-Delhi – 110016 ( India )**

2. Quotations delivered at other addresses or delivered without proper acknowledgement will not be entertained.
3. Please quote the price at FOB / CIF New- Delhi, inclusive of installation charges.
4. Quote should be in Indian Rupees as well as US Dollars or GBP and to be valid for at least three months.
5. Attached all technical literature and list of similar installation done in India.
6. Warranty as per OEM.
7. Mention if you can provide any technical support like training of IIT Delhi personnel at IIT Delhi or in your factory and providing a technical person for operation of the equipment for the initial period of 2 years. Kindly mention about this in technical bid.
8. If the quote is being submitted by the representative of the principals/manufactures themselves, a valid Agency ship/ Dealership certificate authorizing the agent to quote to IIT Delhi on behalf of the Principals should be enclosed.
9. The institute reserves the rights to accept/reject any/all quotations without assigning any reasons thereof.
10. Complete set of manuals for the operation of the equipment should be given. All circuit diagrams, other mechanical and electrical schematics must be provided to main unit, sub systems and accessories.
11. Delivery within 20 weeks on receipt of PO.
12. Clearly specify the installation requirements – Such as space, power, frequency, environment ( Temperature and Humidity) .
13. If the item quoted are proprietary in nature, please enclose proprietary certificate from the principals stating “certificate that ----- is proprietary item of M/s ----- and no other manufacture make these items”.
14. If the bidder is Indian agent, the agency certificate should be enclosed.
15. Please produce compliance certificate for the specification.
16. Please ensure that the Indian agent has been enlisted with the Department of Expenditure, evidence may please be attached.
17. All bank charges payable in India are to buyer's account and the bank charges in seller's country to seller's account.

*M. Nabi*

( Dr. M.Nabi )

**Electrical Engineering Dept.**

**IIT Delhi,**

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