**NATIONAL CENTER CATALYSIS RESEARCH (NCCR)**

**DEPARTMENT OF CHEMISTRY**

**INDIAN INSTITUTE OF TECHNOLOGY MADRAS**

**CHENNAI – 600036, INDIA**

 **Date: 6 October 2016**

**Due date: 26 October 2016**

**Item name: Gas Chromatography (1 no.)**

1. Quotations are invited in a **two bid system** for the items shown overleaf (in Annexure I). The offers / bids should be submitted as Technical bid and Financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and Financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Tender for supply of “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” should be written on the left side of the Outer bigger cover and sealed.

2. The quotations should be valid for sixty days from the due date and the period of delivery required should also be clearly indicated.

3. The total cost of the equipment in terms of CIP Chennai should be clearly mentioned.

4. Terms of warranty and guarantee should be explicitly mentioned.

5. Packing and delivery charges, customs and clearance duty should be clearly stated.

6. Goods shall not be supplied without an official supply order.

7. Local firms : Quotations should be for free delivery to this institute. If quotations for ex-godown delivery charges should be indicated separately.

8. Firms outside Chennai: Quotations should be for F.O.R. Chennai. If F.O.R. consignor station, freight charges by passenger train / lorry transport must be indicated. If ex-godown, packing, forwarding and freight charges must be indicated.

9. The rate of sales / general taxes and the percentage of such other taxes legally leviable and intended to be claimed should be distinctly shown along with the price quoted. Where this is not done, no claim for sales / general taxes will be admitted at any stage and on any ground whatsoever. The taxes leviable should take into consideration that we are entitled to have Concessional Sales Tax (CST) applicable to non-government educational institutions run with no profit motive for which a concession sales tax certificate will be issued at the time of final settlement of the bill.

10. Payment : Specify the mode of payment and if advanced payment has to be made. Every attempt will be made to make payment within 30 days from the date of receipt of bill / acceptance of goods, whichever is later.

11. IIT Madras is exempt from payment of excise duty and is eligible for concessional rate of customs duty. Necessary certificate will be issued on demand.

12. IIT Madras has the right to accept the whole or any part of the tender or portion of the quantity offered or reject it in full without assigning any reason.

13. The sealed quotation may be sent to

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| **Dr.P. Selvam (Professor)** **National Centre for Catalysis Research (NCCR)****Department of Chemistry****IIT Madras Chennai – 600036****Ph. (O) +91-44-22574235/4200/5211** |

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**SPECIFICATION OF GAS CHROMATOGRAPH FOR :**

1. **TRACE LEVEL OF ANALYSIS FOR H2, O2, N2, CO, CO2 AND C1-C2 HYDROCARBONS IN GAS SAMPLES AND**
2. **ANALYSIS DIFFERENT HYDROCARBONS IN LIQUID PHASE.**

**OVEN:**

* The gas chromatograph must have user friendly color graphical touch-screen interface
* The gas chromatograph shall have programmable pneumatic control (PPC)
* Program steps should be 3 ramps and 4 plateaus or better.
* Temperature range: 10 °C above ambient to 450 °C or better.
* Temperature ramp rate should be 45 deg C/min or better.
* Large enough to hold at least one packed column and one capillary column, 50 mt length

**PNEUMATICS:**

* Programmable pneumatic control (PPC) should be provided for columns and detectors.
* All the Injector and Detectors should have Pneumatic pressure Control.
* PPC should provide direct setting in mL/min, psig or kPa or cm/sec
* Pneumatic program rates: 0-100.0 psi/min, 0-100.0 mL/min, 0-200.0 cm/sec or better.

**INJECTORS**

1. **Split/split less capillary injector for liquid injection:**
* Operating Temperature range should be from 50 ˚C to 450 ˚C in 1 ˚C increments
* Carrier gas should able to set through constant flow, pressure and velocity.
* PPC pneumatics should include automatic control of split vent by split flow or split ratio
1. **Packed Column injector for the gas sampling:**
* Suitable packed column injector for the sampling of gases for analysis – mixtures of N2, O2, H2, CO, CO2- In continuous flow mode or injection through gas tight syringes
* Suitable for operation with zero dead space Gas Sampling valve with appropriate plumbing and gas sampling loops.

**COLUMNS**

1. Packed column or columns suitably configured for quantitative separation of gas mixtures containing H2, N2, O2, CO, CO2 and C1-C2 light hydrocarbons in one single injection. Gas samples may have some moisture content.
2. General purpose capillary column for analysis of hydrocarbons- Carbowax-20M 50 met length.

**DETECTORS**

1. **FID detector for hydro carbon analysis:**

* Wide linear dynamic range
* PPC pneumatics should be software flow control of hydrogen and air
* System should be with Automatic ignition on units installed with PPC
* Operating temperature should be 100 °C to 450 °C in 1 °C increments
* Minimum detectable quantity: < 3 • 10–12 g C/sec octane or better.
* Linearity: > 10\*6 or better.
1. Pulsed Discharge Ionization Detector (PDID)
* For analysis of permanent gases and C1-C2 hydrocarbons
* Minimum detectable level of gases -100 ppb
* Detection limits to be demonstrated during installation.

For technical enquiries contact:

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