

**DEPARTMENT OF CHEMICAL ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGY: TIRUCHIRAPPALLI - 620 015**

24.01.2014

**Minutes of the pre-bid conference**

Tender Notification No.: NITT/F.NO:SIF004/PLAN2013-14 dt. 19.12.2013

**Specification for HYPHETHENATED THERMOGRAVIMETRIC ANALYSER (TGA) WITH GC MS TG-GCMS for Evolved Gas Analysis**

S.No	Original tender specification	Amended specification
1.	<b>A. <u>TGA Specification</u></b> <ul style="list-style-type: none"> <li>Temperature Range: Room temperature to <b>1000°C</b></li> </ul>	No Change
2.	<ul style="list-style-type: none"> <li>Heating Rate : 0.1° C to 200°C</li> </ul>	No Change
3.	<ul style="list-style-type: none"> <li>Vertical TGA should have Ultra Microbalance with <b>0.1 µg sensitivity</b></li> </ul>	No Change
4.	<ul style="list-style-type: none"> <li>Weighing range up to 1200 mg including pan weight.</li> </ul>	No Change
5.	<ul style="list-style-type: none"> <li>The system should have Low Thermal Mass Furnace with built-in Platinum resistance heating elements. The furnace should have facility of auto calibration, auto clean furnace etc.</li> </ul>	No Change
6.	<ul style="list-style-type: none"> <li>The provision of ion sprays to avoid static change.</li> </ul>	No Change
7.	<ul style="list-style-type: none"> <li>Furnace should cool down to room temperature from 1000°C in less than 15 minutes with <b>built-in force air cooling.</b></li> </ul>	No Change
8.	<ul style="list-style-type: none"> <li>Instrument must have <b>Mass Flow Controller</b></li> </ul>	No Change
9.	<ul style="list-style-type: none"> <li>Built-in sleeve chamber for low convection effects.</li> </ul>	No Change
10.	<ul style="list-style-type: none"> <li>Balance assembly should have thermostating capability to minimize isothermal drift.</li> </ul>	No Change
11.	<ul style="list-style-type: none"> <li>Movement of Furnace should be software controlled. Furnace should be</li> </ul>	No Change

	protected with chamber sleeve to avoid convection effects.	
12.	<ul style="list-style-type: none"> <li>Platinum Pans (2 Nos.) to be included in the main offer.</li> </ul>	No Change
13.	<ul style="list-style-type: none"> <li>TGA-GCMS transfer line for EGA to be included</li> </ul>	No Change
14.	<p><b>B. <u>GC MS Specification</u></b></p> <p><b><u>GAS CHROMATOGRAPH MASS SPECTROMETER QUADRUPOLE (GCMS)</u></b></p> <p>Gas Chromatograph:-</p> <p>The instrument key pad must have graphical user interface should have Real-time graphic display of chromatogram,</p>	
15.	<p><b><u>a. Column Oven</u></b> –</p> <ul style="list-style-type: none"> <li>Operating temperature range suitable for all columns and chromatographic separations. 5 degree C above Ambient to 450 °C.</li> </ul>	No Change
16.	<ul style="list-style-type: none"> <li>Maximum achievable temperature ramp rate must be <b>140 °C/min</b></li> </ul>	Maximum achievable temperature ramp rate must be <b>120 °C/min or above</b>
17.	<ul style="list-style-type: none"> <li>Programmable pneumatic control (PPC) for injectors, detectors</li> </ul>	No Change
18.	<p><b><u>b.Autosampler:-</u></b></p> <ul style="list-style-type: none"> <li>➤ Sampling capabilities with 100 vials or more capacity in a single tray for 2 ml vials.</li> </ul>	No Change
19.	<ul style="list-style-type: none"> <li>➤ Number of waste and wash vials: Four waste and four wash vials.</li> </ul> <p>Auto sampler must have the capability to inject the sample on both injectors from the same place without removing or dismantling the system.</p>	No Change
20.	<p><b><u>c. Injector-</u></b></p> <p>Programmable Split/Splitless capillary inlet (S/SL) with a provision for back flush device in the injector - <b>TWO Nos.</b></p>	No Change

	<ul style="list-style-type: none"> <li>➤ Temperature Range : must be the temperature range from <b>50 °C to 500 °C</b> in 1 °C increments with Three-ramps temperature program</li> </ul>	
21.	<ul style="list-style-type: none"> <li>➤ Heating rate of 1 °C/min to 200 °C/min or ballistic</li> </ul>	No Change
22.	<ul style="list-style-type: none"> <li>➤ MS Vent must be quoted to help to change liners easily.</li> </ul>	No Change
23.	<p><b><u>d. Detector:-</u></b> Flame Ionization Detector (FID) – <b>1 No.</b></p>	No Change
24.	<p><b><u>e.MS section:-</u></b></p> <ul style="list-style-type: none"> <li>➤ Mass detector with EI with 250 L Single Turbo pumps with built-in Ion Gauge meter (Pump specification must be clearly mentioned in the original specification sheet/brochure. Below 250 L pump or dual pump specification will not be considered.</li> </ul>	No Change
25.	<ul style="list-style-type: none"> <li>➤ Mass analyzer system: Quadrupole with prefilter</li> </ul>	No Change
26.	<ul style="list-style-type: none"> <li>➤ Mass range: must be minimum 1-1000 amu or more so as to calibrate with Triazene Compound to get the highest mass range.</li> </ul>	No Change
27.	<ul style="list-style-type: none"> <li>➤ Scan rate: Minimum 12,350 amu/sec or more with 0.1 amu step size</li> </ul>	No Change
28.	<ul style="list-style-type: none"> <li>➤ Additional spare filament 1No. Must be quoted apart from the standard supply of 1 No. (Total 2Nos.)</li> </ul>	No Change
29.	<ul style="list-style-type: none"> <li>• <b>Sensitivity</b> for EI with 1 pg of <b><u>OctaFluoroNaphthalene (OFN)</u></b> must be <b>700:1</b> minimum for the <b><u>entire mass range</u></b> and not a specified mass range. You may please submit the same in literature.</li> </ul>	No Change
30.	<ul style="list-style-type: none"> <li>• Capillary Columns: 2 Nos</li> </ul>	No Change
31.	<ul style="list-style-type: none"> <li>• Library: NIST library</li> </ul>	No Change
32.	<ul style="list-style-type: none"> <li>• System should have future up-gradation possibility for CI (both Positive</li> </ul>	No Change

	and Negative Ion Source)	
33.	<ul style="list-style-type: none"> <li>Warranty: Comprehensive three year warranty</li> </ul>	No Change
34.	<ul style="list-style-type: none"> <li>Both TGA and GCMS must be from the same vendor in order to get the future service and spares</li> </ul>	No Change
35.	<p><b><u>f. column split techniques accessory</u></b></p> <p>Instrument must quote with column split technique to go to 3 detector in a single injection(Y splitter will not be acceptable)-. flow-switching and splitting applications</p> <p>Column split techniques must have the following features</p>	No Change
36.	<ul style="list-style-type: none"> <li>Split chromatography between up to minimum 3 channels (detectors, MS, etc.)</li> </ul>	No Change
37.	<ul style="list-style-type: none"> <li>Splitter must be capable for additional sample information,</li> </ul>	No Change
38.	<ul style="list-style-type: none"> <li>back flushing for Remove unwanted compounds from the column after the analytes have eluted,</li> </ul>	No Change
39.	<ul style="list-style-type: none"> <li>MS Isolation to Perform MS, column and inlet maintenance without venting the vacuum for less downtime, solvent venting to Vent unwanted solvent or other large peak from chromatogram.</li> </ul>	No Change
40.	<p><b><u>g. Accessories</u></b></p> <p>Quote all required accessories for TGA and GCMS for trouble free Operation</p>	No Change
41.	<ul style="list-style-type: none"> <li>Ultra High Pure Helium Gas Cylinder (99.9995%) with dual stage SS regulators</li> </ul>	No Change
42.	<ul style="list-style-type: none"> <li>High Pure Nitrogen gas with dual stage regulator,</li> </ul>	No Change
43.	<ul style="list-style-type: none"> <li>High Pure Hydrogen Gas Cylinder with dual stage regulator</li> </ul>	No Change
44.	<ul style="list-style-type: none"> <li>Zero Air gas cylinder with dual stage regulator</li> </ul>	No Change
45.	<ul style="list-style-type: none"> <li>Suitable Gas Purification filter with manifold for Hydrogen, Zero Air, Nitrogen</li> </ul>	No Change

	and Helium	
46.	<ul style="list-style-type: none"> <li>• Branded PC(Dell/Lenova/HP) with HP laser printer</li> </ul>	No Change
47.	<ul style="list-style-type: none"> <li>• 20KVA Online UPS(APC/Numeric) with One Hour Back (Optional)</li> </ul>	No Change
48.	<p><b><u>h. Thermal Desorber Sampler</u></b></p> <ul style="list-style-type: none"> <li>• Thermal desorption system with interface based on PC control and capable of doing analysis of organic pollutants in air or gases such as volatile organic compounds (VOCs) and semi volatiles. The system is compatible to couple with GC-MS. Both GC MS &amp; TD is from the single manufacturer hence best after sales service support and compatibility guaranteed.</li> </ul>	No Change
49.	<ul style="list-style-type: none"> <li>• Automatic transfer of sample tube from sample tray/stand to desorption chamber/heating block. Auto sampler should have minimum capacity of holding 40 tubes.</li> </ul>	No Change
50.	<ul style="list-style-type: none"> <li>• Unique electrically cooled, packed cold trap for operation down to -40°C without the need for liquid nitrogen or carbon dioxide.</li> </ul>	No Change
51.	<ul style="list-style-type: none"> <li>• Automatic leak test facility after each should be available with the TD system.</li> </ul>	No Change
52.	<ul style="list-style-type: none"> <li>• Overlapping tube desorption and GC analysis for maximum productivity.</li> </ul>	No Change
53.	<ul style="list-style-type: none"> <li>• Tube and trap desorption temperatures up to 400°C.</li> </ul>	No Change
54.	<ul style="list-style-type: none"> <li>• Automated tube and trap leak test prior to each analysis to ensure accuracy of analysis.</li> </ul>	No Change
55.	<ul style="list-style-type: none"> <li>• Automated carrier gas purge of tubes prior to desorption to avoid oxidation.</li> </ul>	No Change
56.	<ul style="list-style-type: none"> <li>• Automated Tube conditioning mode with effluent venting. No transfer of effluent to the GC.</li> </ul>	No Change
57.	<ul style="list-style-type: none"> <li>• Vendor to Quote complete Starter Kit ( Consumables)</li> </ul>	No Change
58.	<ul style="list-style-type: none"> <li>• IQ/OQ Documents to be provided by vendor.</li> </ul>	No Change
59.	<b><u>GC with FID/TCD</u></b>	

60.	Microprocessor based Gas Chromatograph with Programmable Electronic Control for complete system.	No Change
61.	<b>I Oven:</b>	
62.	<ul style="list-style-type: none"> <li>Operating temperature range suitable for all columns and chromatographic separations. 5 degree C above Ambient to 450 °C.</li> </ul>	No Change
63.	<ul style="list-style-type: none"> <li>Programmable pneumatic control (PPC) for injectors, detectors</li> </ul>	No Change
64.	<ul style="list-style-type: none"> <li>Cool down time from 250<sup>0</sup>C to 50<sup>0</sup>C in 5 mins or less.</li> </ul>	No Change
65.	<b>II Pneumatics:</b>	
66.	<ul style="list-style-type: none"> <li>Programmable Electronic control for injectors and detectors with single point Control via software &amp; touch screen</li> </ul>	No Change
67.	➤ Facility to compensate for variations in ambient temperature and pressure for Maximum stability.	No Change
68.	<ul style="list-style-type: none"> <li>Direct setting of split flow rates and ratios.</li> </ul>	No Change
69.	<ul style="list-style-type: none"> <li>Automatic leak testing and three ramp pressure program</li> </ul>	No Change
70.	<ul style="list-style-type: none"> <li>Pneumatic program rates 0-100.0 psi/min or 0-100.0ml/min<sup>2</sup> or 0-200.0 cm/s -min.</li> </ul>	No Change
71.	<b>III Injectors (2 no.)</b>	
72.	<ul style="list-style-type: none"> <li>Programmable Split/Split less Capillary Injector or PTV Injector with Pneumatic Control for FID</li> </ul>	No Change
73.	<ul style="list-style-type: none"> <li>Packed Injector with Pneumatic Control for TCD</li> </ul>	No Change
74.	<b>IV. Detectors:</b>	
75.	<b>a. Auto ignite FID</b>	
76.	Software flow control of hydrogen and air.Auto ignition, flame out detection and	No Change

	Reignition. With Best Linearity.	
77.	<b>TCD (Thermal Conductivity Detector) with Optional 6 port gas sampling Value</b> Capillary-column compatible/ Software protection to prevent filament burnout/ Ideal for series operation/1/8-inch fittings/ Conventional pneumatics – reference gas flow controller/ PPC pneumatics – software flow control of reference gas.	No Change
78.	Minimum detectable Quantity: Typically < 1 ppm nonane	No Change
79.	Linearity: > 105	No Change
80.	Makeup gas: Not required for 0.32- to 0.53-mm i.d. columns with flows $\geq 5$ mL/min	No Change
81.	Required for 0.25-mm or smaller i.d. columns	No Change
82.	<b>V. Accessories:</b>	
83.	Quote all required accessories for GCFID/TCD for trouble free Operation	
84.	➤ Ultra High Pure Helium Gas Cylinder (99.9995%) with dual stage SS regulators	No Change
85.	➤ Zero Air gas cylinder with dual stage regulator	No Change
86.	➤ High Pure Hydrogen Gas Cylinder with dual stage SS regulators	No Change
87.	➤ High Pure Nitrogen Gas Cylinder with dual stage SS regulators	No Change
88.	➤ Suitable Gas Purification filter with manifold for Helium, Zero Air, Hydrogen, Nitrogen	No Change
89.	➤ Branded PC(Dell/Lenova/HP) with HP laser printer ➤ 5KVA Online UPS(APC/Numeric) with One Hour Back (Optional)	No Change
90.	➤ 10 $\mu$ l,5 $\mu$ l Syringes,	No Change
91.	➤ Capillary Column @ 1 No	No Change
92.	➤ Packed Column @ 1 No	No Change
93.	<b><u>e.MS section:-</u></b>	No Change

	<ul style="list-style-type: none"> <li>➤ Mass detector with EI with 250 L Single Turbo pumps with built-in Ion Gauge meter (Pump specification must be clearly mentioned in the original specification sheet/brochure. Below 250 L pump or dual pump specification will not be considered.</li> </ul>	
94.	<ul style="list-style-type: none"> <li>➤ Mass analyzer system: Quadrupole with prefilter</li> </ul>	No Change
95.	<ul style="list-style-type: none"> <li>➤ Mass range: must be minimum 1-1000 amu or more so as to calibrate with Triazene Compound to get the highest mass range.</li> </ul>	No Change
96.	<ul style="list-style-type: none"> <li>➤ Scan rate: Minimum 12,350 amu/sec or more with 0.1 amu step size</li> </ul>	No Change
97.	<ul style="list-style-type: none"> <li>➤ Additional spare filament 1No. Must be quoted apart from the standard supply of 1 No. (Total 2Nos.)</li> </ul>	No Change
98.	C. <b>Sensitivity</b> for EI with 1 pg of <b>OctaFluoroNaphthalene (OFN)</b> must be <b>700:1</b> minimum for the <b>entire mass range</b> and not a specified mass range. You may please submit the same in literature.	No Change
99.	D. Capillary Columns:2 Nos	No Change
100.	E. Library: NIST library	No Change
101.	<ul style="list-style-type: none"> <li>➤ System should have future up-gradation possibility for CI (both Positive and Negative Ion Source)</li> </ul>	No Change
102.	F. Warranty: Comprehensive three year warranty	No Change
103.	Both TGA and GCMS must be from the same vendor in order to get the future service and spares	No Change
104.	<b><u>f. column split techniques accessory</u></b>	
105.	<ul style="list-style-type: none"> <li>➤ Instrument must quote with column split technique to go to 3 detector in a single injection(Y splitter will not be acceptable)-. flow-switching and</li> </ul>	No Change

	splitting applications Column split techniques must have the following features	
106.	➤ Split chromatography between up to minimum 3 channels (detectors, MS, etc.)	No Change
107.	➤ Splitter must be capable for additional sample information,	No Change
108.	➤ back flushing for Remove unwanted compounds from the column after the analytes have eluted,	No Change
109.	➤ MS Isolation to Perform MS, column and inlet maintenance without venting the vacuum for less downtime, solvent venting to Vent unwanted solvent or other large peak from chromatogram.	No Change
110.	<b><u>g. Accessories</u></b> Quote all required accessories for TGA and GCMS for trouble free Operation	No Change
111.	➤ Ultra High Pure Helium Gas Cylinder (99.9995%) with dual stage SS regulators	No Change
112.	➤ High Pure Nitrogen gas with dual stage regulator	No Change
113.	➤ High Pure Hydrogen Gas Cylinder with dual stage regulator	No Change
114.	➤ Zero Air gas cylinder with dual stage regulator	No Change
115.	➤ Suitable Gas Purification filter with manifold for Hydrogen, Zero Air, Nitrogen and Helium	No Change
116.	➤ Branded PC(Dell/Lenova/HP) with HP laser printer	No Change
117.	➤ 20KVA Online UPS(APC/Numeric) with One Hour Back (Optional)	No Change
118.	<b><u>h. Thermal Desorber Sampler</u></b>	
119.	➤ Thermal desorption system with interface based on PC control and capable of doing analysis of organic pollutants in air or gases such as volatile organic	No Change

	compounds (VOCs) and semi volatiles. The system is compatible to couple with GC-MS. Both GC MS & TD is from the single manufacturer hence best after sales service support and compatibility guaranteed.	
120.	➤ Automatic transfer of sample tube from sample tray/stand to desorption chamber/heating block. Auto sampler should have minimum capacity of holding 40 tubes.	No Change
121.	➤ Unique electrically cooled, packed cold trap for operation down to -40°C without the need for liquid nitrogen or carbon dioxide.	No Change
122.	➤ Automatic leak test facility after each should be available with the TD system.	No Change
123.	➤ Overlapping tube desorption and GC analysis for maximum productivity.	No Change
124.	➤ Tube and trap desorption temperatures up to 400°C.	No Change
125.	➤ Automated tube and trap leak test prior to each analysis to ensure accuracy of analysis.	No Change
126.	➤ Automated carrier gas purge of tubes prior to desorption to avoid oxidation.	No Change
127.	➤ Automated Tube conditioning mode with effluent venting. No transfer of effluent to the GC.	No Change
128.	➤ Vendor to Quote complete Starter Kit ( Consumables)	No Change
129.	➤ IQ/OQ Documents to be provided by vendor.	No Change
130.	<b><u>A. GC with FID/TCD</u></b>	
131.	Microprocessor based Gas Chromatograph with Programmable Electronic Control for complete system.	No Change
132.	<b>I Oven:</b>	

133.	<ul style="list-style-type: none"> <li>Operating temperature range suitable for all columns and chromatographic separations. 5 degree C above Ambient to 450 °C.</li> </ul>	No Change
134.	<ul style="list-style-type: none"> <li>Programmable pneumatic control (PPC) for injectors, detectors</li> </ul>	No Change
135.	<ul style="list-style-type: none"> <li>Cool down time from 250<sup>0</sup>C to 50<sup>0</sup>C in 5 mins or less.</li> </ul>	No Change
136.	<b>II Pneumatics:</b>	
137.	<ul style="list-style-type: none"> <li>➤ Programmable Electronic control for injectors and detectors with single point Control via software &amp; touch screen</li> </ul>	No Change
138.	<ul style="list-style-type: none"> <li>➤ Facility to compensate for variations in ambient temperature and pressure for Maximum stability.</li> <li>➤ Direct setting of split flow rates and ratios.</li> </ul>	No Change
139.	<ul style="list-style-type: none"> <li>➤ Automatic leak testing and three ramp pressure program</li> </ul>	No Change
140.	<ul style="list-style-type: none"> <li>➤ Pneumatic program rates 0-100.0 psi/min or 0-100.0ml/min<sup>2</sup> or 0-200.0 cm/s -min.</li> </ul>	No Change
141.	<b>III Injectors (2 no.)</b>	
142.	<ul style="list-style-type: none"> <li>➤ Programmable Split/Split less Capillary Injector or PTV Injector with Pneumatic Control for FID</li> </ul>	No Change
143.	<ul style="list-style-type: none"> <li>➤ Packed Injector with Pneumatic Control for TCD</li> </ul>	No Change
144.	<b>IV. Detectors:</b>	
145.	<b>Auto ignite FID</b>	
146.	<ul style="list-style-type: none"> <li>➤ Software flow control of hydrogen and air. Auto ignition, flame out detection and Reignition. With Best Linearity.</li> </ul>	No Change

147.	➤ <b>TCD (Thermal Conductivity Detector) with Optional 6 port gas sampling Value</b>	No Change
148.	Capillary-column compatible/ Software protection to prevent filament burnout/ Ideal for series operation/1/8-inch fittings/ Conventional pneumatics – reference gas flow controller/ PPC pneumatics – software flow control of reference gas.	No Change
149.	Minimum detectable Quantity: Typically < 1 ppm nonane	No Change
150.	Linearity: > 105	No Change
151.	Makeup gas: Not required for 0.32- to 0.53-mm i.d. columns with flows $\geq 5$ mL/min	No Change
152.	Required for 0.25-mm or smaller i.d. columns	No Change
153.	<b>V. Accessories:</b>	
154.	Quote all required accessories for GCFID/TCD for trouble free Operation	No Change
155.	➤ Ultra High Pure Helium Gas Cylinder (99.9995%) with dual stage SS regulators	No Change
156.	➤ Zero Air gas cylinder with dual stage regulator	No Change
157.	➤ High Pure Hydrogen Gas Cylinder with dual stage SS regulators	No Change
158.	➤ High Pure Nitrogen Gas Cylinder with dual stage SS regulators	No Change
159.	➤ Suitable Gas Purification filter with manifold for Helium, Zero Air, Hydrogen, Nitrogen	No Change
160.	➤ Branded PC(Dell/Lenova/HP) with HP laser printer	No Change
161.	➤ 5KVA Online UPS(APC/Numeric) with One Hour Back (Optional)	No Change
162.	➤ 10 $\mu$ l, 5 $\mu$ l Syringes,	No Change

163.	➤ Capillary Column @ 1 No	No Change
164.	➤ Packed Column @ 1 No	No Change
165.	<b><u>GC with ECD/NPD</u></b>	
166.	➤ Microprocessor based Gas Chromatograph with Programmable Electronic Control for complete system.	No Change
167.	<b>I Oven:</b>	
168.	➤ Operating temperature range suitable for all columns and chromatographic separations. 5 degree C above Ambient to 450 °C.	No Change
169.	➤ Programmable pneumatic control (PPC) for injectors, detectors	No Change
170.	➤ Cool down time from 250 <sup>0</sup> C to 50 <sup>0</sup> C in 5 mins or less.	No Change
171.	<b>II Pneumatics:</b>	
172.	➤ Programmable Electronic control for injectors and detectors with single point Control via software & touch screen	No Change
173.	➤ Facility to compensate for variations in ambient temperature and pressure for Maximum stability.	No Change
174.	➤ Direct setting of split flow rates and ratios.	No Change
175.	➤ Automatic leak testing and three ramp pressure program	No Change
176.	➤ Pneumatic program rates 0-100.0 psi/min or 0-100.0ml/min <sup>2</sup> or 0-200.0 cm/s -min.	No Change
177.	<b>III Injectors (2 no.)</b>	
178.	a. Programmable Split/Split less Capillary Injector or PTV Injector with Pneumatic Control for ECD/NPD	No Change

179.	Minimum 100 Sample Vial Autosampler should be quoted as optional	No Change
180.	<b>IV. Detectors:</b>	
181.	a. <b>ECD (Electron Capture Detector)</b>	
182.	High Sensitivity/High Operating temperature for maximum stability/Pneumatics for software flow control of make-up gas	No Change
183.	Source: 15 mCi <sup>63</sup> Ni	No Change
184.	Temperature protect: 470 °C by software	No Change
185.	Carrier gas: Either Ar/CH <sub>4</sub> or N <sub>2</sub>	No Change
186.	Operating temperature: 100 °C to 450 °C in 1 °C increments	No Change
187.	Minimum detectable < 0.05 pg perchloroethylene with	Minimum detectable Quantity: < 0.05 pg perchloroethylene with argon/methane or nitrogen
188.	Quantity: argon/methane or nitrogen	Line to be removed
189.	Linearity: > 10 <sup>4</sup>	No Change
190.	Signal filtration: 200, 800 msec	No Change
191.	Makeup gas: Standard	No Change
192.	b. <b>NPD (Nitrogen Phosphorous Detector)</b>	
193.	Modular design/ Change bead in less than one minute/ Pre aligned bead/ Rapid conditioning, up and running in less than two hours/ 1/8-inch fittings/ Conventional pneumatics – pressure regulator for hydrogen, needle valve for air/ PPC pneumatics – software flow control of hydrogen and air	No Change
194.	Operating temperature: 100 °C to 450 °C in 1 °C increments	No Change

195.	Minimum detectable $5 \cdot 10^{-14}$ g N/sec 2,4-dimethylaniline	No Change
196.	quantity: $5 \cdot 10^{-14}$ g P/sec tributylphosphate	No Change
197.	Linearity: $> 10^4$	No Change
198.	Signal filtration: 50, 200, 800 msec	No Change
199.	Selectivity: 50,000:1 (N/C)	No Change
200.	10:1 (P/N)	No Change
201.	Input range: 1, 20	No Change
202.	Makeup gas: Not required	No Change
203.	<b>V. Accessories:</b>	
204.	Quote all required accessories for GC ECD/NPD for trouble free Operation	No Change
205.	➤ Ultra High Pure Helium Gas Cylinder (99.9995%) with dual stage SS regulators	No Change
206.	➤ High Pure Nitrogen Gas Cylinders with dual stage SS regulator	No Change
207.	➤ High Pure Hydrogen Gas Cylinders with dual stage SS regulator	No Change
208.	➤ Zero Air gas cylinder with dual stage regulator	No Change
209.	➤ Suitable Gas Purification filter with manifold for Helium, Zero Air, Hydrogen, Nitrogen ➤ Branded PC(Dell/Lenova/HP) with HP laser printer	No Change
210.	➤ 5KVA Online UPS(APC/Numeric) with One Hour Back (Optional)	No Change
211.	➤ 10 $\mu$ l, 5 $\mu$ l Syringes,	No Change
212.	➤ Capillary Column @ 2 No's	No Change
		5% Bank Guarantee for 5 years towards the

		supply of spares after warranty period.
	<b>Note:</b> Any other accessories apart from the mandatory accessories and systems mentioned above may be quoted separately. Pre-installation/post-installation training expenses (including travel, boarding and lodging) should be borne by the supplier	



Dr. J. Sarat Chandra Babu  
(Initiating Faculty)