B. Tech.
(SEM. VI) EXAMINATION, 2006-07
PROCESS INSTRUMENTATION

Time : 2 Hours] [Total Marks : 50

Note : Attempt all questions.

1 Attempt any four parts of the following : 3.5×4=14
   (a) Explain the term ‘Calibration’ of a measuring instrument. Describe the steps required to calibrate a measuring instrument.
   (b) Discuss the effect of ‘Aging’ on the performance of measuring instruments.
   (c) (i) Define the term ‘Accuracy’ of a measuring instrument.
        (ii) What will be the accuracy of a measurement system for which the Transducer has an accuracy of ±2%, the signal conditioner on accuracy of ±1% and the Recording unit an accuracy of ±0.5%.
   (d) Define the terms ‘True-value’ ‘Static-error’ and ‘Instrument-reading’ and show their relationship in the form of an equation.
   (e) Show the response of a second order measuring instrument when it is subjected to a sinusoidal change of input.

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(f) Explain the terms ‘Deviation’ and ‘Standard Deviation’ used in context of analysing the measurement data obtained from measuring instruments.

2 Attempt any four parts of the following: 3×4=12

(a) Describe the advantages of ‘Liquid-in-Glass’ thermometers and discuss their limitations.

(b) A chromel-constantan Thermocouple is to be used for the measurement of temperature with cold junction at 20°C. What will be the thermocouple e.m.f. at 200°C. The following is the data from standard tables:

<table>
<thead>
<tr>
<th>Temp °C</th>
<th>0</th>
<th>20</th>
<th>200</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.m.f.  mV</td>
<td>0</td>
<td>1.192</td>
<td>13.419</td>
<td>11.949</td>
</tr>
</tbody>
</table>

(c) With the help of a suitable figure describe the working of ‘OPTICAL PYROMETER’ and mention its applications.

(d) What are the methods used for the measurement of pressure in corrosive liquids? Describe any one of them.

(e) Mention the common types of ‘Liquid-column Manometers’ used for the measurement of pressure. Describe the working any one of them.

(f) Mention the applications of 'Pirani Guage' for measurement of vacuum. With the help of suitable diagram describe its working.

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3 Attempt any two parts of the following: 6x2=12

(a) Describe the principle and applications of the following devices used for flow measurement:
   (i) Orifice meter
   (ii) Rotameter

(b) With the help of a figure describe various parts and working of the Bubbler system for liquid-level measurement.

(c) With the help of a figure explain the principle and working of a Variable Area Viscometer.

4 Attempt any two parts of the following: 6x2=12

(a) Describe the principle and working of ultraviolet spectrometer and mention its applications.

(b) Write short notes on the following:
   (i) Dialatometer 3
   (ii) Hydrogen Sulfide Analyzer. 3

(c) Describe the working and application of the following:
   (i) Psychrometer 3
   (ii) Dew Point Recorder. 3