(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2122 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION 2011-12

INDUSTRIAL INSTRUMENTATION

Time : 3 Hours *Total Marks : 100*

Note :— (1) **All** questions are compulsory, however internal choices are given.

(2) All questions carry **equal** marks.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) Define gauge pressure, atmospheric pressure, perfect vacuum, absolute pressure and differential pressure. Establish relation between them using proper sketch. Name any three units of pressure and write relation between them.

(b) The dimension of a C-type bourdon tube made of Monel metal are as follows : r = 36.5 mm, x = 16 mm, t = 0.35 mm. Calculate the displacement of the free end if a pressure of 1500 kPa is applied. The modulus of elasticity of Monel metal is 180 GN/m^2.

(c) What is See-back effect ? Which instrument is based upon this effect ?

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(d) Describe the principle, construction and working of disappearing filament type pyrometer.

(e) Describe with a neat sketch the working of capacitive level indicator.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) What is the construction and principle of thermocouple for the temperature measurement ? Why cold junction compensation is required for thermocouple ?

(b) Explain the principle, construction and working of Piezo-electric Transducer. Derive the expression for its output voltage in the case when it is used as pressure transducer.

(c) Explain the principle, construction and working of McLeod gauge.

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) What is viscosity ? Why is the viscosity measurement important for industrial processes ? Explain the construction and working principle of any one of the industrial viscosity meter.

(b) How you define moisture ? Describe thermal dying method of moisture measurement.

(c) What is calibration ? Describe the calibration of thermocouple by comparison method.

4. Attempt any **four** parts of the following : **(5×4=20)**

   (a) Explain principle, construction and working of differential pressure transmitter.

   (b) The characteristics resistance-temperature relation of any thermistor is given by $R_T = aR_0 \exp(b / T)$. A thermistor has a resistance of 3980 Ω at the ice point and 795 Ω at 50° C. Calculate the value of constant a and b for this thermistor.

   (c) A Pitot tube is used for the measurement of velocity of flow of water having the density 1000 kg/m^3. Determine the velocity of flow at the head of Pitot tube if it produces a differential pressure of 10 kN/m^2 between two outlets. The same differential pressure is obtained in air at an altitude where density of air is 0.65 kg/m^3. Determine the flow velocity.

   (d) What is the most common low level industrial level indicator ? How does it work ?

   (e) Describe the construction and working of Ultrasonic flow-meter.

5. Write the short notes on any **two** of the following : **(10×2=20)**

   (a) Pirani Gauge

   (b) LVDT

   (c) Optical Pyrometers.