(i) Calculate the deflection at the free end for the cantilever when a force of 25 N is applied at this end. The modulus of elasticity for steel is 200 GN/m².

(ii) An LVDT with a sensitivity of 0.5 V/mm is used. The voltage is read on a 10 V voltmeter having 100 divisions. Calculate the overall sensitivity of measurement system.

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

(a) Pirani Gauge

(b) LVDT

(c) Optical Pyrometers.

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EIC-502

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

PAPER ID : 132503

Roll No.

SEM V

EXAMINATION, 2014-15

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.

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(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 ?

(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) Give the classification of non electrical method used for temperature measurement. Explain the Bimetallic thermometer with Bimetallic sensors.

(b) Discuss the characteristics of thermocouple materials used in thermo electric sensors. Mercury in steel thermometer employs a Bourdon pressure gauge which has a range of 0-6.0 MPa for the pointer rotation from 0 to 270°C. In the temperature calibration process, the pointer movement was set to 0° rotation at 0°C and the instrument indicates 250°C rotation corresponding to 200°C. Determine the senstivity of the instrument in rad/°C.

(c) Draw a schematic of the disappearing filament type of optical pyrometers and explain it.

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

(a) Discuss the Piezo electric metrical and transducer used for measurement of weight.

(b) Define load cell and balance method in weight measurement. Explain the following load cells in brief :

(i) Hydraulic load cell

(ii) Pneumatic load cell

(iii) Cantilever type load cell.

(c) Explain Industrial Viscosity meter in brief. A steel cantilever is 0.25 m long, 20 mm wide and 4 mm thick :