Total No. of printed pages = 4

**CAI-612/II/6th Sem/2014/N**

# INDUSTRIAL INSTRUMENTATION

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What are load cells ? Describe the operation of a hydrostatic load cell and a elastic load cell. 7

   (b) Describe a method of torque measurement. 5

   (c) What do you understand by LVDT ? How it is used as a transducer ? 2

2. (a) How velocity measurement is done using a drag-cup type tachometer ? Explain. 6

   (b) What are the components of a accelerometer ? Explain the operation of variable reluctance type accelerometer. 6

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(c) What do you understand by API scale and Baume scale in density measurement ? 2

3. (a) What are the basic principles of density measurements ? Describe the construction and working of displacer type densitometer. 6

(b) Define kinematic viscosity, specific viscosity and relative viscosity. 3

(c) Explain the working of Saybolt's viscometer with a suitable diagram. 5

4. (a) Explain the working of Mcleod gauge with a suitable diagram. 5

(b) How pressure measurement is done by capacitive type pressure transducer ? Discuss. 6

(c) Fill in the blanks : $1 \times 3 = 3$

(i) 1 Psi = ..... Pa

(ii) 1 Pa = ..... $N/m^2$

(iii) In a manometer, the pressure difference $P_1 - P_2$ = ..... .

5. (a) What do you mean by solid expansion type of temperature measurement ? Discuss the construction and working of the device. Also mention an important application of this method. 5

(b) Discuss a method for compensation in temperature measurements using RTD. 5

(c) What is the principle of working of a thermocouple ? Name the types of thermocouples with measurement ranges. Why compensation is necessary in thermocouple measurements ? 4

6. (a) Describe the physical laws that governs the operation of a radiation pyrometer. 3

(b) What are the commonly used radiation detector ? Discuss three of them. 5

(c) Explain the basic principle, construction and working of an optical pyrometer with a relevant diagram. 6

7. (a) Write short notes on any *two* :

(i) Velocity measurement using D.C generator

(ii) Vibration measurement using piezo-electric transducer

(iii) Ionization gauges. 5×2=10

(b) With the help of a suitable diagram, explain the operation of a seismic pick-up. 4