

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION

13.704 INDUSTRIAL INSTRUMENTATION (A)

Time: 3 Hours

Max. Marks : 100

PART – A

(Answer all questions. Each question carries 4 marks.)

1. What is the principle of a Magneto elastic Load cell?
2. A mild steel shaft having an outer radius of 15mm and inner radius of 10mm is used to connect a motor drive to constant speed torque. If the shear modulus of steel is 80GN/m^2 and the maximum strain value is 0.0015, find the load torque?
3. Explain capacitance type of pressure transducer?
4. Explain the working of Bimetallic Thermometer?
5. With a neat sketch brief the working of an electrolysis type hygrometer?

PART – B

(Answer any one question from each Module.)

Module – I

6.
 - a) With suitable figures explain the working, advantages and limitations of Piezoelectric Accelerometers and LVDT based accelerometers? (12 Marks)
 - b) Explain in detail how measurement of force is done by means of a Strain Gauge Load cell?(6 Marks)
 - c) What is the significance of Baume scale and API scale?(2 Marks)
7.
 - a) With suitable figures explain the working, advantages and limitations of Capacitive Tacho and Drag Cup type Tacho? (12 Marks)
 - b) Explain the difference in working of a Hydraulic and Pneumatic load cell?(6 Marks)

c) What are the advantages and limitations of stroboscopic tachos? (2 Marks)

Module – II

8.

- a) With neat sketches, explain in detail the working of McLeod Vacuum Gauge? (12 Marks)
- b) Explain the working of a Micro manometer? (6 Marks)
- c) What are the advantages of Mercury to be used as a manometric fluid? (2 Marks)

9.

- a) Explain the working of a Pirani Gauge?
- b) Explain the working of a Bourdon Gauge?
- c) Give the basic principle of an Ionization Gauge?

Module – III

10.

- a) A mercury in steel Thermometer which employs a Bourdon Pressure gauge which has a range of 0-6MPa for the pointer rotation from 0-270°. In the process of temperature calibration the pointer was set to 0° at 0°C of temperature and the instrument indicated 250° rotation corresponding to 200° . Determine
 - i) Sensitivity of instrument in rad/°C (3 Marks)
 - ii) Error due to ambient temperature rise of 16°C, if the thermometer bulb has 8 times the volume of capillary and tube together (5 Marks)
 - iii) The error in temperature values if the bulb is raised by 60cm from calibration elevation (4 Marks)
- b) Explain the source of errors in filled in system of temperature measurement (8 Marks)

11.

a) Explain the structure and working of a platinum filament RTD?(12 Marks)

b) What is the significance of using 3lead and 4 lead RTDs?(4 Marks)

c) A platinum resistance thermometer has resistance of 140.5Ω and 100Ω at 100°C and 0°C respectively. If its resistance becomes 305.3Ω when it is in contact with a hot gas, determine the temperature of the gas. Given the temperature coefficient of platinum is $0.0039^{\circ}/\text{C}$. (4 Marks)

Module – IV

12.

Explain the construction, principle ,working and excitation types of an electromagnetic flow meter? Give its advantages and limitations? (20 Marks)

13.

a) Explain the difference in working of Saybolt viscometer and Rotameter type viscometer? (12 marks)

b) Write short notes on i) Viscosity b)Consistency iii)Absolute and Specific humidity iv) Dew point (8 Marks)
