

Question Bank

Industrial Instrumentation [EIC-502]

UNIT - I

- 1) What is Pressure? What are different types of pressure scales? Write at least 5 units of pressure.
- 2) Explain the construction and working of U-tube manometer? Write its advantages and disadvantages.
- 3) What are the errors that can occur in manometers? Write are their advantages and disadvantages?
- 4) Write the names of the fluids and properties that are normally used in manometers.
- 5) What are Elastic type pressure transducers? What are different types of primary sensing elements used in them? Explain their construction with a neat and clean diagram.
- 6) Describe the working principle and construction of Mcleod gauge with a neat and clean diagram. Write its advantages and disadvantages, also mention its range.
- 7) What are the different types of Bourdon tube gauges? Describe the construction and working of C-type bourdon tube gauge with a neat and clean diagram. Write its advantages and disadvantages.
- 8) What are Electrical pressure transducers? Explain the basic principle, construction and working of Capacitive pressure transducer with a neat and clean diagram.
- 9) Which instrument is used for calibrating high pressure gauges? Describe its construction and working a neat and clean diagram.
- 10) What are Bellows? Explain construction and working of bellow pressure gauges.
- 11) Explain the construction and working of LVDT along with its characteristics.
- 12) Give the basic principle of piezoelectric transducer. Write its advantages and disadvantages.
- 13) Write the basic principle, construction and working of Pirani gauge. What are its advantages, disadvantages and range?
- 14) Describe the basic principle, construction and working of Ionization gauge. Write its advantages and disadvantages, also mention its range.
- 15) Explain the working of Knudsen gauge and write down the range of pressure in which it is suitable.
- 16) Explain the working of Ionization gauge and write down the range of pressure in which it is suitable.
- 17) Calculate 10 Kg/cm^2 into (i) mmWG (ii) mmHg (iii) Bar.

- 18) In a U-tube manometer with mercury filled in it the difference in the height of fluid in the arms is $h=0.4$ m. Find out (i) the pressure difference p_1-p_2 in kg/cm^2 (ii) pressure p_1 in gauge and absolute scale if p_2 is open to atmosphere in mmWG (iii) pressure p_1 in gauge and absolute scale if p_2 side is evacuated and sealed in mmHg. (Assume that $p_1 > p_2$)
- 19) Describe with neat sketches the following types of pressure gauges:
- Bourdon tubes
 - Capsules
- 20) Discuss about Ionization gauges along with its basic elements and sensitivity factor.
- 21) Define the following terms:
- Gauge pressure
 - Absolute pressure
 - Differential pressure
 - Static pressure
 - Velocity pressure
- 22) A Mcleod gauge has volume of bulb and measuring capillary $V = 100 * 10^{-6} \text{ m}^3$ and a measuring capillary diameter of 1mm. Calculate the pressure indicated when the reading of the measuring capillary is 30mm in case approximate formula is used. What is the error if the exact formula is used for measurement of pressure?

UNIT -II

- 23) Sketch a thermocouple circuit showing the important details and discuss in brief about the method used to measure output obtained from a thermocouple.
- 24) What are different temperature scales? Write their reference points and absolute zero point.
- 25) What is the principle of thermal expansion method for measuring temperature?
- 26) What are the different types of Expansion thermometers? Describe the construction and working of any one of them with a neat and clean diagram.
- 27) What are the sources of error in Filled-system thermometers? Write their advantages and disadvantages.
- 28) What are thermocouples? Explain their working principle with a neat diagram? What are the materials normally used in making thermocouples? What are their major advantages? Give their range.
- 29) What is RTD? Explain its principle and working? What are its advantages and disadvantages?

- 30) Discuss the feature of Thermistor which makes it suitable for wide industrial application and also explain the reason for negative temperature coefficient in Thermistor.
- 31) Write in detail about three important aspects of a radiation thermometer. Discuss their involvement in the measurement of temperature.
- 32) Discuss the characteristics of thermistor?
- 33) An experiment is conducted to calibrate a copper constant thermocouple. With cold junction at 0°C , emf obtained at boiling point of water (100°C) and boiling point of sulphur (445°C) are 5 mV and 25 mV, respectively. If the relation is given by " $e-t_1-t_2=a(t_1-t_2)+b(t_1^2-t_2^2)$ "
- Determine constants a and b.
 - The above thermocouple indicates 2 mV with cold junction at 40°C . Determine the unknown hot junction temperature.
 - If the cold junction is maintained at 40°C , what would be the emf when hot junction temperature is at 500°C ?
- 34) What are pyrometers? Explain the working principle of optical pyrometer? Also explain the three conditions of filament? Write its range, advantages and disadvantages.
- 35) Describe different types of thermal expansion methods. Explain liquid in glass thermometer with the help of a neat and well labeled diagram.
- 36) Convert the temperature -40°C in to K, F and R scales.
- 37) For a one percent accuracy meter whose span is 1000°C , what is the probable error at any point on the scale? If the lower scale starts from 200°C , what is the range of the instrument? Also find the percentage error when the meter reads 700°C ?
- 38) Why are compensating lead wires used in thermocouples?
- 39) What are radiation pyrometers?
- 40) What is automatic null balance radiation thermometer? Explain with block diagram.
- 41) A thermistor has a resistance of $3980\ \Omega$ at ice point and $794\ \Omega$ at 50°C . The resistance temperature relationship is given by $R_T = a R_0 \exp\left(\frac{b}{T}\right)$. Calculate the constants a and b. Also calculate the range of resistance to be measured in case the temperature varies from 40°C to 100°C .
- 42) What is automatic null balance radiation thermometer? Explain with block diagram.
- 43) Describe the material used for RTDs and its salient features.
- 44) What is meant by industrial type bimetallic thermometers?
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45) Give the salient features of liquid in glass thermometers.

46) Calculate the temperature sensitivity of a thermistor at 100°C . Its resistivity at 100°C is $1.1\ \Omega\text{m}$. Express the result in $\Omega\text{m/K}$. Take $\beta = 4120\text{K}$ at 100°C .