



N. B. : (1) Question No. 1 is compulsory.

(2) Solve any four questions from remaining six questions.

(3) Assume suitable data whenever necessary.

(4) Justify answers with neat sketches whenever necessary.

1. (a) Explain Block diagram of generalized measurement system with suitable example. 8
- (b) In a parallel circuit the current in one branch I_1 is $100 \pm 2A$ and in the other, I_2 is $200 \pm 5A$. Determine the total current considering errors as (I) limiting error (II) probable error. 4
- (c) A Platinum resistance thermometer has a resistance of 140.5Ω and 100Ω at 100 and $0^\circ C$ respectively. If its resistance becomes 305.3Ω when it is in contact with a hot gas determine the temperature of the gas. 4
- (d) Critically compare Resolution and threshold. 4
2. (a) Explain following terms with respect to LVDT. 10
 - (i) Construction
 - (ii) Working Principle
 - (iii) Residual voltage its causes and minimization.
- (b) A copper-constant thermocouple was found to have linear calibration between $0^\circ C$ and $400^\circ C$ with emf at maximum temperature (reference junction temperature $0^\circ C$) equal to 20.68 mV. 10
 - (i) Determine the correction which must be made to the indicated emf if the cold junction temperature is $25^\circ C$.
 - (ii) If the indicated emf is 8.92 mV in the thermocouple circuit determine the temperature of the hot junction.
3. (a) List out different level measurement methods. Explain liquid level measurement using capacitive transducer when liquid is conducting and non conducting. 10
- (b) For a certain thermistor, $\beta = 3140K$ and the resistance at $27^\circ C$ is known to be 1050Ω . The thermistor is used for temperature measurement and the resistance measured is as 2330Ω . Find the measured temperature. 10
4. (a) Explain law of intermediate temperatures and law of intermediate metals in case of thermocouples. Also give their significance. 10
- (b) A linear resistance potentiometer is 5 cm long and is uniform wound with a wire having a resistance 10000Ω . Under normal condition, the slider is at the centre of the potentiometer. Find the linear displacement when the resistance of the potentiometer as measured by a wheatstone bridge is (i) 3850Ω (ii) 7560Ω . Are the two displacement in the same direction? If it is possible to measure a minimum value of 10Ω resistance with the above arrangement, find the resolution of the potentiometer in cm. 10

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5. (a) Explain Basic principle of following transducers. 10
- (i) Piezo-electric
 - (ii) Piezo-resistive
 - (iii) Capacitive
 - (iv) Thermo-electric
 - (v) Inductive.
- (b) Explain magnetic type liquid level measurement system. 10
6. (a) State materials and their typical properties for following transducers. 10
- (i) RTD
 - (ii) Thermocouple
 - (iii) Piezo-electric Transducers.
- (b) What is digital transducer ? What are different types of digital transducers ? Explain working of rotary encoder for angular displacement measurement. 10
7. (a) State fits and gages. Explain types of fits. 10
- (b) Explain (i) Combination of limiting errors 10
- (ii) Probable error of combination.

When final result 'X' is generated from individual measurements p, q, r,.....