Q.P. Code : 38555

Duration: 3 Hours   Total Marks : 80

Note:
1. Question one is compulsory.
2. Attempt any three from remaining five questions
3. Assume suitable data wherever necessary.

Q1.	**Attempt any four**	**20**
a.	State Piezo-resistive effect and piezo electric effect.	
b.	Explain the principle of strain gauge and derive gauge factor = 1+2 v.	
c.	In a rotameter the density of a float is always less than that of flowing fluid. State true or false and justify your answer.	
d.	Compare orifice and venturi meter.	
e.	Draw and explain pressure measurement scheme using bourdon tube and LVDT.	

Q2. a	Explain different arrangements of strain gauges for better sensitivity and temperature compensation.	**10**
Q2. b	A strain gauge is bonded to a beam 0.1 m long and has a cross sectional area 4 cm². Young's modulus for steel is 207 GN/m². The strain gauge has an unstrained resistance of 240 ohm and a gauge factor of 2.2. When a load is applied, the resistance of gauge changes by 0.013 ohm. Solve the change in length of the steel beam and the force applied to the beam.	**10**

Q3.a	Describe the following transducers in detail:	**10**
	(i) Bellows (ii) Bourdon tube (iii) Dead weight tester	
Q3.b.	Describe working of different types of manometer with advantages and limitations of each type.	**10**

Q4.a.	State basic principle and explain McLeod gauge.	**10**
Q4.b.	What are the steps in calibration of pH meter? Explain pH measurement setup.	**10**

Q5.a.	Derive Bernoulli's equation.	**10**
Q5.b.	A venturi tube of throat diameter 60 mm is placed in a water pipe of diameter 100 mm to measure the volumetric flow. The volumetric flow rate through the tube is 0.08 m³/s and the water has a density of 10^3 kg/m³ and viscosity of 10^{-3} Ns/m².	**10**

2F4A7267688055B483146CAF05C2851B

i) Determine the Reynold's number for these conditions.

ii) The coefficient of discharge is 0.99. Determine the upstream-to-throat differential pressure.

Q6.   Write short notes (any two):   20
   a. Radiation and ultrasonic densitometers
   b. MEMS
   c. Optical fiber sensor
   d. Viscosity measurement

****

2F4A7267688055B483146CAF05C2851B