Question Paper

Exam Date & Time: 31-May-2023 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

IV Semester End Semester Examination

INDUSTRIAL INSTRUMENTATION [ICE 2252]

Marks: 50

Duration: 180 mins.

Descriptive Questions

Answer all the questions.

Section Duration: 180 mins

1)		Differentiate the construction and working of a C type bourdon tube and a helical bourdon tube used (5) for pressure measurements. [CO2, BL4, PO5]		
	A)			
	В)	With the help of neat diagram, describe the working of an Ionization gauge for low pressure measurement highlighting a suitable application for the same. [CO2, BL2, PO3]	(3)	
	C)	A diaphragm type of pressure transducer gives a central deflection of 0.2 mm when a pressure of $1.2 \times 10^6 \text{ N/m}^2$ is applied. An electromechanical device, namely, linear variable differential	(2)	
		transducer (LVDT) converts the input displacement of pressure transducer into voltage and has a sensitivity of 60 V/mm. Determine the overall sensitivity of the pressure gauge in $V/(N/m^2)$ and		
		determine the unknown pressure when the output voltage of 2.5V is observed on the meter. [CO2, BL3, PO6]		
2)		With the help of suitable equations and connections, compare a two wire and three wire RTD in a Wheatstone bridge circuit for temperature measurement. [CO1, BL4, PO3]	(5)	
	A)			

B) A piping system has a "Y" configuration for separating the flow as shown in Figure. The diameter of (3) the inlet leg is 12 in., and the diameters of the outlet legs are 8 and 10 in. The velocity in the 10 in. leg is 10 ft./sec. The flow through the main portion is 500 lbm/sec. The density of water is 62.4 lbm/ft³. What is the velocity out of the 8 in. pipe section? [CO3, BL3, PO5]



- The sensitivity of a Bismuth-Iron pair thermocouple is 91μ V/oC. What is the output of this (2) thermocouple when the cold junction is at 20^oC and hot junction at 12^oC? [CO1, BL3, PO3]
- The level of ethyl alcohol is measured by a capacitive transducer from 0 to 5 m as shown in the figure. The following are the specifictions: Dielectric constant of ethyl alcohol K =26. Cylindrical separation d =0.5cm. Plate outer radius = 5.75cm. Find the range of the capacity variation for the measurement range. [CO4, BL3, PO4]



B)

C)

3)

In an ultrasonic system used for measuring the flow of liquid through a tube, the transmitter-receiver (3) pairs are placed 30 cm apart in line with the liquid flow. The difference in transit times of the ultrasound while travelling upstream and downstream between the transmitter receiver pair is 8.01µs. Find the velocity of sound in that liquid if the velocity of liquid flow is 30m/s. [CO3, BL3, PO5]

C) A rotameter tube is 0.3 m long with an internal diameter of 25 mm at the top and 20 mm at the bottom. The diameter of float is 20 mm, sp.gr. is 4.8 and its volume is 6 cm³. If the coefficient of discharge is 0.7. Find the velocity of water flow trough the tube. [CO3, BL3, PO5]

4	+)	Compare the constructional detail and working principle of three different types of mass flowmeters. [CO3, BL4, PO5]	(5)
	A)		
	B)	With a neat schematic, discuss the working of a toothed rotor variable reluctance tachometer. [CO5, BL2, PO5]	(3)
	C)	Examine the flow regimes that characterise vertical gas-liquid flow. [CO3, BL4, PO5]	(2)
5	5)	Compare and contrast the principle, constructional details and working of AC tachogeneratror and DC tachogenerator. [CO5, BL4,PO2]	(5)
	A)		
	B)	Distinguish the two major approaches of multiphase flow metering. [CO3, BL4, PO1]	(3)
	C)	Design a level measurement device which gives a varying current in steps of 100mA with respect to 6 step changes. [CO4, BL3, PO2]	(2)

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