GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
INDUSTRIAL INSTRUMENTATION
EI501

TIME ALLOTTED: 3 Hours **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No.
1.	(i)	Gauge Pressure is a) Absolute Pressure b) Absolute Pressure-Atmospheric Pressure c) Atmospheric Pressure - Absolute Pressure d) Atmospheric Pressure	1	CO1,CO3
	(ii)	At the stagnant point of the pitot tube a) Velocity is very high b) Pressure is very low c) Velocity is zero d) None of the above	1	CO1
	(iii)	The Standard output range of pneumatic pressure transmitter is a) 0 to 8 psi b) b)3 to 15 psi c) c)3 to 15 gm/cm^2 d) 4 to 20 gm/cm^2	1	CO1
	(iv)	What type of manometer is best for measuring low pressure? a) Well b) Inclined c) U-tube d) Multiple tubes.	1	CO1,CO2
	(v)	Reynold's number of 3000 indicates a) turbulent flow b) laminar flow c) transitional flow d) none of the above	1	CO1
	(vi)	Pt-100 means temperature bulb having a) 0 ohm at 0^0C b) 100 ohm at 0^0C c) 0 ohm at 100^0C d) 100 ohm at 100^0C	1	CO1,CO3

(vii)	Which of the following flow meters has the highest-pressure drop for a given range of flow? a) Orifice meter b) Venturi meter c) Flow nozzle d) Rota meter	1	CO1,CO4
(viii)	A flow transmitter with a 4-20mA output as a calibrated range of 1.0-6.0 m^3/sec. What flow rate is indicated by a current of 12mA? a) 7.0 m^3/sec b) 3.75 m^3/sec c) 4.5 m^3/sec d) 3.6 m^3/sec	1	CO3
(ix)	Non-contact type temperature sensor is a) Thermocouple b) Thermistor c) Pyrometer d) Thermostat	1	CO1
(x)	Which flow meter works on constant pressure drop principle? a) Venturimeter b) Rotameter c) Turbine flow meter d) Vortex flow meter	1	CO4
(xi)	Which of the following temperature sensors has excellent linear characteristics a) RTD b) Thermocouple c) Silicon-based IC chip d) Radiation pyrometer	1	CO2,CO3
(xii)	A Pirani gauge is based on the principle of a) Change in thermal conductivity of a gas with pressure b) Change in viscosity of the gas with pressure c) Change in electrical conductivity of the gas with pressure d) Change in ion current produced by the impact of electrons with pressure.	1	CO4

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

			Marks	**CO No.**
2.	(a)	What is Coriolis principle? Prove that ,the torque experienced by the tube in a Coriollis mass flow meter is directly proportional to mass flow rate of the fluid.	5	CO1,CO3
3.	(a)	Explain the operating principle of Bourdon tube pressure gauge.	2	CO1
	(b)	What are the two types of adjustments done in a Bourdon tube gauge?	3	CO2

4.	(a)	Why air purge method is so popular in industrial liquid level measurement system?	2	CO2,CO3
	(b)	Draw the schematic of such a system, explain its operation, and discuss the precautions to be taken in its operations.	3	CO2,CO1
5.		A displacer with area of cross section 5 cm^2,length 8m and specific gravity 6 is used for measuring water level in a tank maximum level 8 meters. The displacer is weighted with spring balance directly. In addition, the displacer is used to measure the level from the bottom of the tank. (i)Find out level when spring balance reads 23, 22, and 21 kgs. (ii) What does the spring balance read when the tank is full?	5	CO3
6.	(a)	What are the different sources of errors in filled system thermometer?	3	CO2
	(b)	Name any two types of thermocouples and mention their individual temperature range.	2	CO3

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

			Marks	**CO No.**
7.	(a)	What is meant by cold-junction compensation? Describe one technique for cold junction Compensation.	6	CO4
	(b)	Design an electronic circuit using RTD which may provide 0-200mV output corresponding to 0-200 ◦C. Assume that R_0= 100Ω and R_{200}= 180Ω.	4	CO4
	(c)	Explain why three wire RTD connection is advantageous over two wire RTD connection.	5	CO4
8.	(a)	Explain how magnetic level switch works. With proper schematic diagram.	5	CO4,CO3
	(b)	Describe with neat sketch the construction & working of the capacitive level measuring system	5	CO1,CO3
	(c)	What is the significance of discharge coefficient? Differentiate between mass flow meter and volume flow meter.	5	CO1,CO3
9.	(a)	Explain why three-wire RTD connection is advantageous over two-wire RTD connection.	5	CO2,CO4
	(b)	A platinum resistance thermometer has a resistance of 140.5 ohm and 100 ohm at 100^0 C and 0^0C,respectively.If its resistance becomes 305.3 ohm when it is in contact with a hot gas, determine the temperature of the gas.(Temperature coefficient of platinum=0.0039^0 C^{-1})	7	CO1
	(c)	What do you mean by Cold junction Compensation Technique?	3	CO1
10.	(a)	Explain with a neat sketch, the construction and working of a Mc Leod gauge. Mention its advantages and disadvantages.	5	CO1,CO2

	(b)	How is dead weight tester used for pressure instrument calibration	7	CO2,CO4
	(c)	What are the limitation of U tube Manometer. Explain the advantage of inclined manometer with suitable	4	CO2,CO4
11.		Write short notes on any three of the following: 3 x 5 =15		
	(a)	Hazardous instrumentation	5	CO5
	(b)	D/P transmitter	5	CO2
	(c)	Bi-color type level indicator	5	CO3
	(d)	Open channel flow meter	5	CO2
	(e)	Thermistor	5	CO4