Exam Date & Time: 14-Jun-2022 (09:00 AM - 12:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, JUNE 2022 INDUSTRIAL INSTRUMENTATION [ICE 2252]

Marks: 50

A

Answer all the questions.

Ins Sy	tructions to mbols have	o Candidates: Answer ALL questions Missing data may be suitably assumed e their usual significance.	
1)		Explain the construction and working of disappearing filament type optical pyrometer. List its disadvantages.	(5)
	A)		
	B)	Calculate the temperature sensitivity of a thermistor at 100^{0} C. Its resistivity at 100^{0} C is 1.1 Ω m. Express the result in Ω m / ⁰ K. Take β =4120K at 100 ⁰ C.	(3)
	C)	A two wire Platinum RTD with connection leads of copper are used to measure temperature of a water bath. If the temperature of the water bath is 270° C, find out the net resistance of the RTD. The material characteristics are as below: α_{Cu} =0.193 percentage per degree Celsius; α_{Pt} = 0.003927 per degree Celsius, R _{cu} and R _{Pt} at 30°C as: 128 Ω and 558 Ω respectively.	(2)
2)		Explain the construction and working of well type manometer and list its advantages.	(5)
	A)		
	B)	Discuss the principle and working of double bell gauge for pressure measurement.	(3)
	C)	A bellow used for pressure measurement has a LVDT connected as the secondary transducer. The sensitivity of the bellow and the LVDT is 3 mm/PSI and 30mV/mm respectively. If the output range of the LVDT is -3V to 2V, Calculate range of pressure the bellow can measure.	(2)
3)		Explain the principle and working of Capacitive type level measurement and list its limitations.	(5)
	A)		
	B)	A horizontal venturimeter with inlet diameter 200mm and throat diameter 100mm is used to measure the flow of water. The reading of a differential pressure meter connected to it	(3)

Duration: 180 mins.

4)

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shows 0.72V. If the coefficient of discharge is 0.98 and the transfer characteristics of the differential pressure meter is 30 mV/kPa, find out the flow rate in m³/s.

C) A turbine type flow meter shown below measures the flow rate by momentarily entrapping a segment of the fluid. If each chamber holds 360cm³ of fluid, and the turbine rotates at a speed of 5000rpm, find out the flow rate in m³/s.



(2)

With neat schematic explain the principle, construction and working of a Orifice flow meter for flow measurement. Compare the pressure recovery profile of the venturi meter over orifice meter .
(5)

B) With a neat schematic, discuss the working of a centrifugal tachometer.

(3)

C) From the thermocouple table shown below (with 0°C reference), Find out the output voltage if the temperature of the measurement junction is 554°C and reference is 0°C.

TYPE J: IRON-CONSTANTAN													
	0	5	10	15	20	25	30	35	4()	45			
-150	-6.50	-6.66	-6.82	-6.97	-7.12	-7.27	-7.40	-7.54	-7.66	-7.78			
-100	-4.63	-4.83	-5.03	-5.23	-5.42	-5.61	-5.80	-5.98	-6.16	-6.33			
-50	-2.43	-2.66	-2.89	-3.12	-3.34	-3.56	-3.78	-4.00	-4.21	-4.42			
-0	0.00	-0.25	-0.50	-0.75	-1.00	-1.24	-1.48	-1.72	-1.96	-2.20			
+0	0.00	0.25	0.50	0.76	1.02	1.28	1.54	1.80	2.06	2.32			
50	2.58	2.85	3.11	3.38	3.65	3.92	4.19	4.46	4.73	5.00			
100	5.27	5.54	5.81	6.08	6.36	6.63	6.90	7.18	7.45	7.73			
150	8.00	8.28	8.56	8.84	9.11	9.39	9.67	9.95	10.22	10.50			
200	10.78	11.06	11.34	11.62	11.89	12.17	12.45	12.73	13.01	13.28			
250	13.56	13.84	14.12	14.39	14.67	14.94	15.22	15.50	15.77	16.05			
300	16.33	16.60	16.88	17.15	17.43	17.71	17.98	18.26	18.54	18.81			
350	19.09	19.37	19.64	19.92	20.20	20.47	20.75	21.02	21.30	21.57			
400	21.85	22.13	22.40	22.68	22.95	23.23	23.50	23.78	24.06	24.33			
450	24.61	24.88	25.16	25.44	25.72	25.99	26.27	26.55	26.83	27.11			
500	27.39	27.67	27.95	28.23	28.52	28.80	29.08	29.37	29.65	29.94			
550	30.22	30.51	30.80	31.08	31.37	31.66	31.95	32.24	32.53	32.82			
600	33 11	33.41	33.70	33.99	34.29	34.58	34.88	35.18	35.48	35.78			
650	36.09	36.38	36.69	36.99	37.30	37.60	37.91	38.22	38.53	38.84			
700	30.00	30.30	39.78	40.10	40.41	40.73	41.05	41.36	41.68	42.00			

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- 5) Compare and contrast the principle, constructional details and working of AC tachogenerator and DC tachogenerator.
 - A)
 - B) Describe the different flow regimes in a Gas-liquid flow through a vertical pipe.

(3)

(5)

C) A float level transducer as shown is used to measure the level of water in a tank. The sensor is connected to one arm of a wheatstone bridge with the other arm resistances as 100Ω , 1K Ω and 1K Ω . If the bridge supply voltage is 12V, find out the output voltage range of the sensing system.



(2)

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