GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
SENSORS AND TRANSDUCERS
EI401

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)	The principle of operation of LVDT is based on the variation of a) Self-inductance b) Mutual inductance c) Reluctance d) Permanence	1	CO3
	(ii)	In Hall Effect sensor, the magnitude of the voltage generated depends on the _____. a) Strength of the magnetic field b) Strength of the current c) Property of the conductor d) All the above	1	CO1
	(iii)	Potentiometric resistance transducer measures _____ a) linear displacement b) rectangular displacement c) square displacement d) triangular displacement	1	CO1
	(iv)	Self-generating type transducers are _____ transducers. a) Active b) Passive c) Secondary d) Inverse	1	CO1
	(v)	Capacitive transducers are normally employed for_____ measurements a) Static b) Dynamic c) Transient d) Both static and dynamic	1	CO2
	(vi)	Which of the following is not a type of radiation detectors? a) Geiger Muller counter b) Proportional counter c) Semiconductor detector d) Flame emission detector	1	CO4

(vii)	Strain gauge is a _____ a) inductive transducer b) resistive transducer c) capacitive transducer d) mechanical transducer		1	CO1
(viii)	_ _ _ _ _ _can be defined as the variation in the constant of proportionality between the input physical quantity and the output electrical signal a) Resolution b) Accuracy c) Precision d) Linearity		1	CO1
(ix)	When nuclear radiations pass through, gas ionization (Townsend discharge) is produced.' This is the principle of which of the following detectors? a) Proportional counter b) Flow counter c) Geiger Muller counter d) Scintillation counter		1	CO4
(x)	Which of the following acts as quenching gas in Geiger Muller counter? a) Alcohol b) Argon gas c) Krypton d) Hydrogen		1	CO4
(xi)	Quartz and Rochelle salt belongs to _____ of piezo-electric materials a) Natural group b) Synthetic group c) Natural or Synthetic group d) Fiber group		1	CO2
(xii)	The sensitivity factor of strain gauge is normally of the order of a) 1 to 1.5 b) 1.5 to 2.0 c) 0.5 to 1.0 d) 5 to 10		1	CO1

GROUP – B
(Short Answer Type Questions)

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

			Marks	CO No
2.	(a)	Describe how the voltage is produced in pizochrystal due to the application of Tension and compression.	3	CO3
	(b)	What is bimorphs and multimorphs?	2	CO3
3.	(a)	What is pneumatic load cell- Explain its working with proper diagram.	5	CO1

4.	(a)	How the displacement measurement is done using magnetostriction?	5	CO2
5.	(a)	What is Giger Muller Counter?	2	CO4
	(b)	Draw a neat sketch of it and explain its function.	3	CO4
6.		How Stroboscope is used for the measurement of r.p.m. of a moving shaft?	5	CO2

GROUP – C
(Long Answer Type Questions)

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

			Marks	CO No.
7.	(a)	Draw the suitable diagram of capacitor microphone and describe the principle.	5	CO2
	(b)	Derive the sensitivity of Half bridge, Full bridge and Quarter Bridge.	6	CO1
	(c)	Why temperature compensation is important in strain gauge measure. Mention two methods.	4	CO1
8.	(a)	Draw the schematic diagram of an LVDT and explain its electro-mechanical transfer characteristics.	3	CO1,CO2
	(b)	Why the output of LVDT is amplitude modulated?	6	CO2
	(c)	How the direction sensitivity of LVDT can be done using phase sensitive demodulation technique?	6	CO2
9.	(a)	A linear resistive POT is of 50 mm length & uniformly wound with the wire of resistance 10,000Ω. Under normal condition the wiper is at center of the POT. Find the displacement if the resistance of the POT is recorded i) 3975 Ω ii) 7500 Ω. iii) In both of these two cases what are the direction of displacements? iv) If it is possible to measure the minimum value of 10 Ω resistance with the above arrangement find resolution of the POT in mm.	7	CO1
	(b)	Describe Strain sensing principle and derive the expression of gauge factor of a resistive strain gauge.	6	CO2
	(c)	What is poisons bridge?	2	CO2
10.	(a)	Describe the basic principle of a Hall sensor.	3	CO4
	(b)	How this sensor is used for measurement of current through a conductor?	5	CO4
	(c)	Derive the expression of hall voltage & show what are the factors and parameters of the sensors, does the Hall voltage output depend for a given field condition?	7	CO4
11.		Answer any **three** of the following: -	3x5=15	
	(a)	Strain Gauge Rosset	5	CO1
	(b)	SMART Sensors	5	CO4
	(c)	Self-inductive type Transducer	5	CO2
	(d)	MEMS	5	CO4
	(e)	Accelerometer	5	CO3