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Total Number of Pages : 02 **B.Tech**

PAU7J001

7th Semester Regular Examination 2019-20

SENSOR & TRANSDUCERS

BRANCH : AUTO

Max Marks : 100

Time : 3 Hours

Q.CODE : HR013

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) A thermistor has resistance temperature co-efficient of -5% over a temperature range of 25 ºC to 50 ºC. If the resistance of thermistor is 100 Ω at 25 ºC. Then Determine resistance at 40 ºC.

b) What is the pressure range of bellows?

c) What is dynamic error in measurement systems?

d) What is PUSH-PULL configuration?

e) Why Gamma-rays are used for level indicator?

f) Loading effect in instrumentation can be minimized by use of which amplifier.

g) The moving core in a LVDT is made of which material?

h) The strain gauge has a gauge factor G = -100.State the type of strain gauge.

i) J type thermocouple is made of which materials.

j) What is the difficulty in conditioning low level d.c signals in instrumentation system?

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) A resistance strain gauge with a gauge factor of 2 is fastened to a steel member which is subjected to a strain of 1μ strain. If the original resistance value of the gauge is 130Ω.calculate the change in resistance.

b) Derive and draw the response of a second order element to a unit step input.

c) Explain the installation problems of thermocouple.

d) What is the difficulty in conditioning low level d.c signals in instrumentation system?

e) Explain the statistical characteristics of measurement system briefly

f) Explain how displacement is being sensed by LVDT by suitable characteristic curve.

g) Explain the ultrasonic sensing element with one measurement scheme.

h) Derive the voltage-displacement relationship for a loaded potentiometer. Also find non-linearity as % of fsd.

i) Explain the principle, advantage and disadvantage of RTD.

j) Distinguish bellows and diaphragm.

k) Explain a complete a.c. carrier system with the schematic block diagram with highlighting PSD.

l) Explain the installation problems of thermocouple and cold junction compensation briefly.

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Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 The following results were obtained when a pressure transducer was tested in a laboratory under the following conditions : **(16)**

a. Ambient temperature 20 °C, supply voltage 10 V (standard)
b. Ambient temperature 20 °C, supply voltage 12 V
c. Ambient temperature 25 °C, supply voltage 10 V

Input (barg)→	0	2	4	6	8	10
Output (mA)→						
I	4	7.2	10.4	13.6	16.8	20
II	4	8.4	12.8	17.2	21.6	28
III	6	9.2	12.4	15.6	18.8	22

Predict an output value when the input is 5 barg, V_S = 12 V and ambient temperature is 25 °C.

Q4 Derive an expression for output voltage gain of an instrumentation amplifier. Also differentiate differential amplifier and instrumentation amplifier. **(16)**

Q5 Explain briefly how the push-pull configuration (capacitive type & inductive type) is being used for improvement of linearity and sensitivity of a level sensor? **(16)**

Q6 Derive an expression of variable reluctance displacement sensor. **(16)**
Suggest a method to overcome the non-linearity of the said output expression.