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Total Number of Pages : 02

B.Tech
PEI4I104

4th Semester Regular / Back Examination 2018-19

INSTRUMENT DEVICES & SYSTEM - I

BRANCH : AEIE, EIE, IEE

Max Marks : 100

Time : 3 Hours

Q.CODE : F846

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)

- Write the law of intermediate temperature.
- Show at least one scheme for cold junction compensation.
- What is the necessity of PUSH-PULL configuration for inductive sensor?
- The true value of a voltage is 100V. Values indicated by a measuring instrument is 104, 103, 105, 103 and 105 volts. Find the accuracy of measurement and the precision of the instrument.
- State an application of all pass filters.
- What is the application of PSD in instrumentation?
- What is the consequence of violation of Nyquist sampling theorem?
- Differentiate primary transducer and secondary transducer with some example.
- 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.
- What is the disadvantage of IC temperature sensor?

Part- II

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

- The o/p of a LVDT is connected to a 5V Voltmeter through an amplifier of amplification factor 250. The voltmeter scale has 100 divisions and the scale can be read to $1/5^{\text{th}}$ of a division. An o/p of 2 mV appears across the terminals of LVDT when the core is displaced through a distance of 0.7 mm. Calculate sensitivity of the whole set up.
- Explain the installation problems of thermocouple.
- Explain briefly how the push-pull configuration (capacitive type) is being used for improvement of linearity and sensitivity of a level sensor?
- Compare the RTD and IC temperature sensors.
- Explain the operation of different pressure sensing elements with neat diagram?
- Explain atleast one A/D conversion method.
- Derive an expression for bridge output voltage for pillar load cell (considering 4 gauges in structure).
- Develop an expression for variable reluctance tachometer to measure angular velocity.
- Illustrate the dynamic error in measurement systems.
- Compare LVDT and RVDT.
- Derive an expression for output voltage gain of an instrumentation amplifier.
- Explain atleast six static characteristics of sensing elements briefly.

Part-III

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

Q3 Derive and draw the response of a second order element to a unit step and sinusoidal input. **(16)**

Q4 Explain a complete a.c. carrier system with the schematic block diagram and describe each individual block briefly. **(16)**

Q5 A variable reluctance sensor consists of a core, a variable air gap and an armature. The core is a steel rod of diameter 1 cm and relative permeability 100, bent to form a semi-circle of diameter 4 cm. A coil of 500 turns is wound onto the core. The armature is a steel plate of thickness 0.5 cm and relative permeability 100. Calculate the inductance of the sensor for air gaps of 1 mm and 3 mm. **(16)**

Q6 Discuss the ultrasonic and capacitive type level sensing with suitable diagram. **(16)**