

CBCS SCHEME



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15EE662

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Sensors and Transducers

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the advantages and disadvantages of electrical transducer? (08 Marks)
b. What is piezoelectric effect? Explain working of a piezoelectric device. Explain the construction and working of piezoelectric accelerometer. (06 Marks)
c. The output of a LVDT is connected to a 5V voltmeter through an amplifier whose amplification factor is 250. An output of 2mV appear across the terminal of LVDT, when the core moves through a distance of 0.5mm. If the multimeter has 100 divisions and the scale can be read to a 1/5 of a division. Calculate:
i) The sensitivity of LVDT and
ii) The resolution of the instrument in mm. (02 Marks)

OR

- 2 a. Explain photoconductive and photovoltaic cell. (05 Marks)
b. Explain hall effect. Explain displacement measurement using hall effect transducer. (05 Marks)
c. A parallel plate capacitive transducer uses plates of area 250mm^2 which are separated by a distance of 0.2mm.
i) Calculate the value of capacitance when the dielectric is air having a permittivity of 8.85×10^{-12} F/m.
ii) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm. Obtain the ratio of per unit change of capacitance to per unit change of displacement.
iii) If a mica sheet of 0.01mm thick is inserted in the gap, calculate the value of original capacitance and change in capacitance for the same displacement. Calculate the ratio of per unit change of capacitance to per unit change in displacement. The dielectric constant of mica is 8. (06 Marks)

Module-2

- 3 a. What is the necessity of strain gauge calibration? Explain the method of strain gauge calibration. (05 Marks)
b. State the working principle of optic fiber sensor. With example explain optical fiber sensor configuration. (05 Marks)
c. What are the advantages of synchros and resolvers? Write a note on synchros and resolvers. (06 Marks)

OR

- 4 a. Mention the applications of strain gauge load cell. Explain the construction and working of strain gauge load cell. (05 Marks)
b. With block diagram, explain MEMS. Explain the techniques employed for manufacturing MEMS. Mention the advantages of MEMS over conventional electromechanical system. (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- c. A strain gauge is bonded to a beam which is 10cm long and has a cross sectional area of 4cm^2 . The unstrained resistance and gauge factor of the strain gauge are 220Ω and 2.2 respectively. On the application of the load the resistance of the gauge changes by 0.013Ω . If the modulus of elasticity for steel is 207GN/m^2 , calculate:
- The change in length of the steel beam
 - The amount of force applied to the beam. (03 Marks)

Module-3

- 5 a. What is the necessity of signal conditioning? Explain the process adopted in signal conditioning. (06 Marks)
- b. Define Data Acquisition System. State the objectives of data acquisition system. (06 Marks)
- c. Write a note on applications of data acquisition system. (04 Marks)

OR

- 6 a. Define the steps used in analog to digital conversion process in DAS. Explain the procedure of analog to digital conversion. (06 Marks)
- b. Explain the classification of following amplifiers with examples:
- Mechanical amplifier
 - Fluid amplifier
 - Optical amplifier. (06 Marks)
- c. Define Common Mode Rejection Ratio (CMRR) used in operational amplifiers, explain the advantages of differential amplifier. (04 Marks)

Module-4

- 7 a. Define telemetry, explain general telemetring system with block diagram. (04 Marks)
- b. Explain hydraulic transmission and pneumatic transmission employed in data transmission. (06 Marks)
- c. Define Modem. Explain modem interfacing block diagram. (06 Marks)

OR

- 8 a. With the circuit diagram, explain position telemetering system. Mention its advantages. (06 Marks)
- b. Write a short note on Noise. (06 Marks)
- c. With the circuit diagram, explain Pirani Vacuum gauge. (04 Marks)

Module-5

- 9 a. Explain the functioning of resistance temperature detector also describe its construction. (06 Marks)
- b. Derive an expression for the rate of flow in an venturimeter. (10 Marks)

OR

- 10 a. Explain the construction and working of electromagnetic flow meter. State the applications of electromagnetic flow meter. (10 Marks)
- b. What is a Dynamometer? Explain construction and working of DC dynamometer. (06 Marks)

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