



CBCS SCHEME

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18EE732

Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025 Micro and Nano Scale Sensors and Transducers

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With a neat diagram explain the mechanical structure and working of an induction pressure sensor. (08 Marks)
- b. Discuss the operation of the sensor interface circuit that is used with the inductive pressure sensor. (06 Marks)
- c. Explain the various errors that can occur while measuring the pressure using capacitor based pressure sensor. (06 Marks)

OR

- 2 a. Explain how an ultra high sensitivity pressure sensor is designed for measuring minute values of pressure? (08 Marks)
- b. Describe how the ultra high sensitivity pressure sensor is interfaced to the external circuits. (05 Marks)
- c. Derive the expression relating the total pressure applied as a function of the measured capacitance. (07 Marks)

Module-2

- 3 a. Compare the operations of a conventional and modern smoke detectors. Give a qualitative description of the nano smoke detector. (09 Marks)
- b. Derive the expression for the gate source voltage and drain source voltage of the MOSFET based smoke detector. (07 Marks)
- c. With the help of experimental results show the impact of operating temperature and source emitter distance in a smoke detector. (04 Marks)

OR

- 4 a. Explain how small traces of carbon monoxide gas is detected using detectors. (08 Marks)
- b. Discuss about the new type of acceleration sensor which is widely used in self guided projectiles and unmanned aircrafts. (08 Marks)
- c. Briefly discuss about the tire pressure monitoring sensor. (04 Marks)

Module-3

- 5 a. Discuss the fundamental concept of the new ultraminiature moisture sensor. (09 Marks)
- b. Discuss the performance of the nano moisture sensor based on main and auxillary experimental results. (05 Marks)
- c. Give the block diagram of the interfacing circuit used to measure the ultra capacitance in a moisture sensor. (06 Marks)

OR

- 6 a. What are opto electronic devices? Explain the principle of operation of the advanced optical microphone (08 Marks)
b. With the help of a flowchart explain the flow of the code used in conjunction with the image processing board. (06 Marks)
c. Briefly discuss about the hybrid opto electronic sensor for current and temperature monitoring in overhead transmission lines. (06 Marks)

Module-4

- 7 a. Explain the fundamental principle of operation of the magnetic field sensor. (09 Marks)
b. Explain the response of magnetic field sensor's to AC and DC magnetic fields with result curves. (06 Marks)
c. Derive the expression for the minimum and final kinetic energy of the beta particles in a electromagnetic sensor. (05 Marks)

OR

- 8 a. What is a "Lab on Chip" sensor? Discuss its general structure and operation. (09 Marks)
b. List and brief the applications of CMOS based "Lab on Chip" sensors. (05 Marks)
c. Give a brief note on the porous silicon based sensor for chemical gas vapour detection. (06 Marks)

Module-5

- 9 a. Explain the principle and operation of the alpha particle icing detector, giving details about the interface circuit also. (12 Marks)
b. Discuss the results obtained when the aircraft icing detector is tested under various working conditions. (08 Marks)

OR

- 10 a. Explain about microfluids. Describe the fabrication process of a microfluid device. (10 Marks)
b. What are micro actuators? Discuss their applications. (06 Marks)
c. Write a brief note on wireless lab in chip applications of a microfluidic RFID chip. (04 Marks)
