

# CBCS SCHEME



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18EE647

## Sixth Semester B.E. Degree Examination, June/July 2024 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. Draw the equivalent circuit and electrical characteristic of Piezo-Electric quartz crystal. Explain how this crystal can be used to measure pressure by coupling to a diaphragm. (08 Marks)
- b. Explain how to measure angular velocity using photo-encoder. Explain how op-amp circuits and JK flip flop can be used for signal conditioning of digital rotary encoder output. (08 Marks)
- c. Explain with diagram, magnetic drag method to measure angular velocity. (04 Marks)

OR

- 2 a. Explain how 4538 IC can be used for signal conditioning of digital rotary encoder output to improve resolution. (08 Marks)
- b. Explain how a capacitive change is measured using an aneroid capsule arranged for pressure measurement. (06 Marks)
- c. Explain with diagram, how synchro can be used for the measurement of angular displacement. (06 Marks)

### Module-2

- 3 a. With the help of neat diagram, explain the working of photo-conductive cell. Explain how ORP-12 can be connected and used in a circuit. (10 Marks)
- b. With the constructional diagram of photomultiplier with dynodes, explain its working. Plot its secondary emission characteristic. Draw and explain the electrical arrangement for photomultiplier. (10 Marks)

OR

- 4 a. Explain how a vidicon works with the help of neat cross-sectional diagram of it. Draw equivalent circuit of photo conductor. (08 Marks)
- b. Explain the working of light valve with a neat sketch. (simple) (06 Marks)
- c. Explain how a photodiode can be incorporated in a circuit with the help of neat circuit diagram. (06 Marks)

### Module-3

- 5 a. Describe the construction and working of resistance thermocouples (TC). List the temperature ranges of three materials used for thermocouples. (08 Marks)
- b. For a thermistor, constant B is 3200 K and resistance at 35°C is 3 KΩ. Calculate the resistance at 55°C. (06 Marks)
- c. Draw the characteristic curve of PTC thermistor and with the help of neat circuit diagram, explain how it can be used in a trip sensing circuit. (06 Marks)

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.

OR

- 6 a. With the help of neat diagrams, explain working of a typical pyroelectric passive infrared (PIR) unit and its internal equivalent circuit. (08 Marks)
- b. A temperature detector (RTD) has resistance of  $118 \Omega$  at  $450^\circ\text{C}$ . Its temperature coefficient of resistance is  $7.7 \times 10^{-4}$ . Determine its resistance value at  $25^\circ\text{C}$ . (06 Marks)
- c. Draw the characteristics of NTC thermistor and with the help of neat circuit diagram, explain how it can be used in a circuit. (06 Marks)

Module-4

- 7 a. With neat diagram, explain the working of capacitor microphone and the way in which it is used in circuit. (08 Marks)
- b. With neat diagrams, explain the working principle of carbon granule microphone. (06 Marks)
- c. Explain the working of Seismic detector with neat sketch. (06 Marks)

OR

- 8 a. With neat diagram, explain the working of ribbon microphone and the circuit used to provide a balanced output from it. (08 Marks)
- b. With neat diagram, explain the working principle of moving iron microphone. (06 Marks)
- c. Explain the working principle of electret capacitor microphone with neat sketch. (06 Marks)

Module-5

- 9 a. With neat diagram, explain the construction and working of ionization chamber of a radioisotope type of fire and smoke detector. Draw and explain the block diagram of electronic part of this type of detector. (10 Marks)
- b. Draw neat outline of an electronic relative humidity detector system and explain its working. (05 Marks)
- c. With neat labelled diagram, explain the wet-and-dry thermometer method of measuring humidity. (05 Marks)

OR

- 10 a. Explain with diagram, a mass/weight sensor which makes use of balance system using magnet and coil. Draw its electrical circuit. (08 Marks)
- b. With neat labelled diagram, explain the glass electrode method of measuring pH value. (06 Marks)
- c. With neat sketch, explain how the inductive proximity detectors are used with metal contacts to sense thickness of a non-metallic material. (06 Marks)

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