

CBCS SCHEME



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15MA754

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Smart Materials

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Define a Smart Material. Differentiate between open loop and closed loop Smart structures with suitable examples. (08 Marks)
- b. With neat sketch, explain the working of Inchworm linear motor. (08 Marks)

OR

- 2 a. With appropriate sketches, explain shape memory effect and its characteristics. (08 Marks)
- b. Justify the phase transformations in shape memory alloys through experimental phenomenology by deriving relevant equations. (08 Marks)

Module-2

- 3 a. List the applications of ER and MR fluids. Elaborate on the following applications:
 - i) Clutches
 - ii) Dampers. (08 Marks)
- b. Identify ER and MR fluids effect in Smart fluids. Also explain the mechanisms and properties of Smart fluids. (08 Marks)

OR

- 4 a. With neat sketch, explain the operation of Extrinsic fabry-perot sensor. (08 Marks)
- b. Explain the following applications of fiber optics:
 - i) Crack detection
 - ii) Chemical sensing. (08 Marks)

Module-3

- 5 a. With neat sketch, explain parallel damped vibration observer. (08 Marks)
- b. Explain with experimental setup, gyroscopic vibration observer. (08 Marks)

OR

- 6 a. What is Biomimetics? Explain the characteristics of natural structures. (08 Marks)
- b. Explain the challenges and opportunities in Biomimetics. (08 Marks)

Module-4

- 7 a. Explain the Intrinsic characteristics of MEMS and its devices. (08 Marks)
- b. Explain the steps in photolithography with neat sketches. (08 Marks)

OR

- 8 a. With neat sketches, explain cantilever piezoelectric actuator model. (08 Marks)
- b. Explain the concept and principles of magnetic actuation. (08 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.

Module-5

- 9 a. Write notes on the following applications of polymer MEMS:
- i) Acceleration sensor (08 Marks)
 - ii) Pressure sensor (08 Marks)
- b. Describe the various polymers used in MEMS. (08 Marks)

OR

- 10 a. Explain the following related to MEMS product development:
- i) Performance
 - ii) Accuracy
 - iii) Repeatability
 - iv) Reliability. (08 Marks)
- b. Write notes on the following:
- i) BP Sensors
 - ii) Microphone
 - iii) Acceleration Sensor
 - iv) Gyro Sensors. (08 Marks)

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