



# CBCS SCHEME

15ME745

## Seventh Semester B.E. Degree Examination, June/July 2019 Smart Materials and MEMS

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 composite materials? Explain the classification of composite materials. (08 Marks)  
b. Explain the piezoelectric properties of composite materials having applications as smart materials. (08 Marks)

OR

- 2 a. What are shape memory alloys? Explain its applications. (08 Marks)  
b. With a neat sketch, explain the stress-strain characteristics of shape memory alloys as a function of temperature. (08 Marks)

### Module-2

- 3 a. Define a chemical sensor with an example, and explain working principle of a chemical sensor. (08 Marks)  
b. What is meant by a sensor? What are typical applications of sensors? (08 Marks)

OR

- 4 a. What is signal processing? Explain pulse modulation with a neat sketch. (08 Marks)  
b. Explain the application of MR fluids in the clutches used to transfer torque between rotating mechanical components. (08 Marks)

### Module-3

- 5 a. Explain the analysis of gyroscopic vibration absorbers with a neat sketch. (08 Marks)  
b. Explain the control structure with applications and advantages in control strategies and limitations. (08 Marks)

OR

- 6 a. Explain the Biomimetics characteristics of neutral structures. (08 Marks)  
b. Explain the Biomimetic sensing, its challenges and limitations. (08 Marks)

### Module-4

- 7 a. What is MEMS? Draw a block diagram of micro sensors. List any five micro sensors. (08 Marks)  
b. Explain silicon based MEMS, processing and design. (08 Marks)

OR

- 8 a. What are piezo electric materials? Explain the actuation of structural components by piezoelectric crystals. (08 Marks)  
b. Explain the application of major sensing and actuation methods in air bags of automobiles. (08 Marks)

### Module-5

- 9 a. Explain the application of polymers in MEMS for acceleration, flow, pressure sensors. (08 Marks)  
b. Explain the micro fluids used in MEMS, with their applications. (08 Marks)

OR

- 10 a. Explain the magnetic sensors, in sputtering with the sketches. (08 Marks)  
b. Explain various characteristics of product development of MEMS. (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.