CBCS SCHEME

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain briefly any 6 examples of potential smart structural systems and some mechanism for smart structures. **(06 Marks)**
    b. Illustrate an inchworm linear motor made of 3 PZT stacks, also sketch timing of signals driving the PZT stacks. **(10 Marks)**

OR

2   a. Discuss briefly any 8 impediments to applications of shape memory alloys. **(08 Marks)**
    b. Discuss the concepts of one-way shape memory and two-way shape memory with necessary diagrams. **(08 Marks)**

Module-2

3   a. Discuss typical shear stress Vs strain curves for ER and MR fluids. **(06 Marks)**
    b. Discuss the following with respect to fiber optics :
        i) Numerical aperture   ii) Crack detection using fiber optic sensor. **(10 Marks)**

OR

4   a. Write a brief note on 'twisted and braided fiber optic sensor'. **(08 Marks)**
    b. Present a schematic diagram of a smart structure featuring an embedded fiber – optic sensing system and explain it briefly. **(08 Marks)**

Module-3

5   Write a note on experimental setup and observations of perissogyro vibration absorber. **(16 Marks)**

OR

6   a. Discuss the basic characteristics of natural structures which fascinate design engineers. **(12 Marks)**
    b. Discuss the challenges and opportunities that lie ahead in developing innovative concepts for designing material/structural systems, with an example of dragonfly. **(04 Marks)**

Module-4

7   Discuss 'thermal oxidation of silicon' with a schematic diagrams of the equipment and process. **(16 Marks)**

OR

8   Mention any 2 advantages and any 2 disadvantages of electrostatic sensing, thermal sensing, piezoreistive sensing and piezoelectric sensing. **(16 Marks)**

Module-5

9   a. List the mechanical properties of MEMS polymers. Also, list any 6 polymers used widely for MEMS applications. **(07 Marks)**
    b. Discuss the PDMS micro-fluid channel fabrication process. **(09 Marks)**

OR

10 Discuss the fabrication process for a parylene micro channel. **(16 Marks)**

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