PRESIDENCY UNIVERSITY
BENGALURU

SET-A

SCHOOL OF ENGINEERING
END TERM EXAMINATION – MAY/JUNE 2024

Semester : Semester IV
Course Code : MEC3014
Course Name : Smart Materials
Program : B.Tech.

Date : June 10, 2024
Time : 09.30am to 12.30pm
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ANY FIVE QUESTIONS   5QX2M=10

1. Difference between smart materials and conventional materials.

                                                        (CO1) [Knowledge]

2. Define the martensite phase in steels.

                                                        (CO2) [Knowledge]

3. What are smart materials?

                                                        (CO1) [Knowledge]

4. Explain the Austenite phase.

                                                        (CO2) [Knowledge]

5. Define strength and stiffness.

                                                        (CO2) [Knowledge]

6. Mention packing efficiency of BCC and FCC crystal structure.

                                                        (CO1) [Knowledge]

7. What do you understand by the term damping capacity?

                                                        (CO2) [Knowledge]

PART B

ANSWER ANY FIVE QUESTIONS   5QX10M=50

8. Describe Sensors and actuators. Write 3 applications of sensors and actuators.

                                                        (CO1) [Comprehension]

9. Explain the fabrication process of MEMS using the thermal oxidation method.

(CO2) [Comprehension]

10. Write the general principle used in the design of smart memory alloy actuators.

(CO2) [Comprehension]

11. How one can control active and passive vibration control using shape memory alloys.

(CO3) [Comprehension]

12. Define magnetorheological fluid. Write the basic composition and application of these fluids.

(CO2) [Comprehension]

13. Explain the steps involved in the microfabrication process i.e. photolithography.

(CO3) [Comprehension]

14. Differentiate between electrostrictive material and piezoelectric materials in 5 points.

(CO2) [Comprehension]

PART C

ANSWER ANY TWO QUESTIONS   2QX20M=40

15. (a) Explain MEMS and the components of MEMS.
    (b) Explain the fabrication method of MEMS.

(CO3) [Application]

16. Classify the seven-crystal system of metals. Draw figures for all the classifications.

(CO2) [Application]

17. (a) Explain optical fiber. Classify it based on the number of modes and reflective index.
     (b) Mention the advantages, disadvantages and application of optical fibers.

(CO3) [Application]