Reg. No. : | | | | | | | | | | |

Question Paper Code: 58761

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

One credit Course

Mechanical Engineering

15UME861 – SMART MATERIALS

(Regulation 2015)

Duration: One hour Maximum: 30 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Gallium arsenide was preferred materials for

   (a) 3.5 to 4.6 (b) 3.2 (c) 4.6 to 5.0 (d) 2.3

2. Piezo-electric materials are used in

   (a) transducer (b) load gauges (c) batteries (d) switches

3. _____type charge sensor for highly sensitive detection of a DNA sequence.

   (a) JFET (b) PTFE (c) LED (d) FET

4. Smartness describes self-adaptability, _____ memory and multiple functionalities of the materials or structures.

   (a) self – assembly (b) self-sensing (c) capability (d) consciously

5. Self-healing may also be achieved through deliberately applied _____ mechanisms.

   (a) psychological (b) chemical (c) mechanical (d) obvious

6. PTFE means_____

   (a) polytetra-fluid emulsion (b) polytetra - fluoroethylene

   (c) polytetra - fluorescence (d) polytetra- fluid ethanol

7. The Smart Control System will provide __ for the sensors and actuators.

(a) quality (b) condition (c) feedback control (d) signals

8. Glass fiber tensile strength is_____ (GPa)

(a) 3.5 to 4.6 (b) 3.2 (c) 4.6 to 5.0 (d) 2.3

9. Embedding sensors within structures to monitor _____and damage can reduce maintenance costs and increase lifespan.

(a) strain (b) temperature (c) stress (d) condition

10. Light sensors are used in

(a) Lights (b) electric switches

(c) pyroelectric materials (d) piezoelectric materials

PART – B (1x 20 = 20 Marks)

11. (a) (i) Explain the Optical Properties (Optical Band gap Engineering, Nonlinear Optical effects, Electrochromic, Photochromic and Thermochromic Effects) of Smart Materials. (10)

(ii) Explain the various Application of Smart Materials in Biomedical (artificial lungs, DNA chips, smart hydrogels). (10)

Or

(b) (i) Discuss the Advanced Composites Material – Various Types, Properties, Applications, Merits and Demits. (10)

(ii) Explain the various Application of Smart Materials in Energy (solar cells, solar absorbers, smart windows). (10)