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

Question Paper Code: 50023

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Second Semester

Mechanical Engineering

15UPH203 – MATERIAL SCIENCE

(Common to Chemical Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Figure out the odd one in the following

   (a) Frenkel defect (b) Tilt boundary
   (c) Twist boundary (d) Stacking fault

2. The measurement of a thermodynamic property known as temperature is based on

   (a) First law of thermodynamics (b) Second law of thermodynamics
   (c) Newton's law of cooling (d) Zeroth law of thermodynamics

3. _____ says that the electrical conduction is possible in a solid if free electrons are available.

   (a) Band theory (b) Classical free electron theory
   (c) Ohm's law (d) Domain theory

4. Which of the following is independent of temperature?

   (a) Electronic and ionic polarization (b) Dielectric loss
   (c) Orientation polarization (d) Space charge

5. When the highest level of valence band and the lowest level of conduction band are in same line, it is said to be

(a) Insulator (b) Direct band gap semi conductor
(c) Indirect band gap semi conductor (d) Conductor

6. Which of the following is preferred for laser diodes?

(a) Ge (b) Si (c) GaAs (d) Cu

7. The total number of magnetic lines of forces emanated from the north pole is called

(a) Magnetic flux (b) Magnetization
(c) Magnetic moment (d) Hysteresis

8. Super conductors are perfect diamagnetic. Their conductivity increases with the increase of temperature. In the above two statements, which is correct?

(a) Both the statements I and II are correct (b) Statement I correct II not correct
(c) Statement I not correct II correct (d) Both the statements are incorrect

9. Rolled sheets of graphite are

(a) Nano composite (b) Nanotubes
(c) Nanoparticles (d) Nanowires

10. In nano phase materials by decreasing the grain size, the surface to volume ratio

(a) Decreases (b) Increases
(c) Remains unchanged (d) First increases and then decreases

PART - B (5 x 2 = 10 Marks)

11. What is entropy?

12. Explain thermal break down in dielectric materials.

13. Mention the properties of semiconductor.

14. State Meissner effect.

15. Metallic glasses are superior to its crystalline counterpart-Justify?

PART - C (5 x 16 = 80 Marks)

16. (a) Explain crystal imperfections in detail. (16)

Or

(b) What is Carnot's engine? With neat sketch explain the various processes in Carnot's cycle. (16)

17. (a) Derive an expression for internal field and hence deduce Clausius – Mosotti equation. (16)

Or

(b) Write down the postulates of classical free electron theory. Based on that derive the expression for electrical conductivity of metals. (16)

18. (a) Assuming Fermi Dirac statistics derive expressions for the density of holes in the conduction band of 'p' type semiconductor. (16)

Or

(b) What is Hall Effect? Derive an expression for Hall coefficient in 'p' type semiconductor. Describe an experimental set up for the measurement of Hall coefficient. (16)

19. (a) (i) Explain the domain theory of ferromagnetic materials. (8)

(ii) Explain the formation of domains with various energies. (8)

Or

(b) (i) Explain the BCS theory of superconductivity. (10)

(ii) Explain the construction, working and applications of SQUID. (6)

20. (a) What are shape memory alloys? Explain pseudo elasticity and shape memory effect. (16)

Or

(b) Explain the preparation of nano materials by ball milling technique. (16)

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