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Question Paper Code: 41023

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

Second Semester

Civil Engineering

14UPH203 - MATERIAL SCIENCE

(Common to Mechanical Engineering)

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- In the case of _____, the valence band and the conduction band overlap each other
(a) conductors (b) dielectrics (c) insulators (d) semiconductors
- The valence electrons are _____ the nucleus and they are _____ bound.
(a) ionic (b) covalent (c) hydrogen (d) metallic
- The pure Si and Ge Semiconducting materials have _____ bonds.
(a) intrinsic semiconductor (b) compound semiconductor
(c) n-type semiconductor (d) p-type semiconductor
- In N-type Semiconductor, the Fermi energy level (E_F) lies
(a) between E_c and E_D (b) between E_c and E_v
(c) between E_D and E_v (d) none of these
- The property of magnetic materials of retaining magnetism after withdrawal of the magnetizing force is known as
(a) Retentivity (b) coercivity (c) reluctivity (d) conductivity

6. The superconducting state is perfectly _____ in nature.
 (a) Diamagnetic (b) heat capacity (c) isotopic effect (d) entropy
7. _____ occurs when a dielectric contains occluded gas bubbles.
 (a) thermal breakdown (b) defect breakdown
 (c) intrinsic breakdown (d) discharge breakdown
8. _____ Polarization occur in Ferrites and semiconductors.
 (a) Electronic (b) Ionic (c) Orientation (d) Space charge
9. Nitinol is a
 (a) conducting polymer (b) electrets
 (c) shape memory alloy (d) thermo electric material
10. Milling, Lithographic method and machining are examples of
 (a) bottom-up approach (b) sputtering technique
 (c) plasma assisted technique (d) top-down approach

PART - B (5 x 2 = 10 Marks)

11. List the postulates of free electron theory.
12. Compare intrinsic and extrinsic semiconductor.
13. List the properties of a Ferromagnetic material.
14. Define Dielectric constant.
15. What is meant by glass transition temperature?

PART - C (5 x 16 = 80 Marks)

16. (a) Derive an expression for the electrical and thermal conductivity and hence deduce Wiedemann- Franz law. (16)

Or

- (b) Derive an expression for density of states with a neat diagram. (16)
17. (a) Derive an expression for the density of holes in an intrinsic semiconductor. (16)

Or

- (b) Derive an expression for the carrier concentration in a p-type semiconductor. (16)

18. (a) What are Ferrites? Classify Ferrites based on their structures. (16)

Or

(b) Explain any four properties of Superconductors. (16)

19. (a) Interpret the different types of Polarization mechanism in dielectrics. (16)

Or

(b) Deduce the Clausius-Mossotti equation. (16)

20. (a) Describe the preparation and properties of Metallic glasses. (16)

Or

(b) Illustrate in detail the Sol-gel method to prepare nano material. (16)
