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Question Paper Code: 31023

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

Second Semester

Civil Engineering

01UPH203- MATERIAL SCIENCE

(Common to Mechanical Engineering)

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State any two postulates of classical free electron theory of metals.
2. State Wiedemann-Franz law.
3. What is Hall Effect.
4. Write down the properties of compound semiconductors.
5. What is Bohr magnetron? Give its value.
6. Define Cooper pairs?
7. Define dielectric constant.
8. What is dielectric loss?
9. State some applications of shape memory alloys.
10. What is shape memory effect?

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for electrical conductivity and thermal conductivity of a conductor and hence obtain Wiedemann - Franz law. (16)

Or

- (b) Derive an expression for density of energy states and hence obtain the expression for carrier concentration in metals. (16)
12. (a) (i) Derive the expression for carrier concentration in n-type semiconductor. (10)
- (ii) Discuss the variation of Fermi level of n-type semiconductor with temperature and impurity concentration. (6)

Or

- (b) What is Hall effect? Derive an equation for Hall coefficient and explain an experiment to determine it. (16)
13. (a) Explain the domain theory of ferromagnetism. Using that theory, explain the formation of hysteresis in ferromagnetic materials. (16)

Or

- (b) (i) Explain Bardeen-Cooper-Schrieffer theory of superconductors. (8)
- (ii) Discuss about high T_c superconductors. (8)
14. (a) (i) What is polarization? Derive an expression for the polarisability in electronic polarization. (10)
- (ii) Explain the dependency of polarization on frequency and temperature. (6)

Or

- (b) Describe various breakdown mechanisms takes place in dielectrics. (16)
15. (a) What are nano materials? How nano materials are synthesised by sol gel and ball milling technique. (16)

Or

- (b) (i) With neat diagram, explain the synthesis of nanoparticles by ball milling method. (10)
- (ii) Write a short note on Fracture, Fatigue and Creep. (6)