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Question Paper Code: 31023

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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 Wiedemann-franz Law.
2. The Fermi energy of Silver is 5.51 eV. What is the average energy of a free electron at 0 K?
3. What is the need for extrinsic semiconductors?
4. Draw the Fermi level in an intrinsic semiconductor at $T=0$ K & $T \neq 0$ K.
5. Define Bohr magneton.
6. What is Meissner effect?
7. What are dielectric losses?
8. Define dielectric constant of a material.
9. What are metallic glasses?
10. What are carbon nanotubes?

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for electrical conductivity based on free electron theory. (16)

Or

(b) Derive an expression for electron concentration in conductor using Fermi distribution function. Use it to find the Fermi energy of electrons at absolute zero. (16)

12. (a) Obtain an expression for the intrinsic charge density of an intrinsic semiconductor. (16)

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) Differentiate between Type I and Type II superconductors. (8)

(ii) Describe high temperature superconductors. (8)

14. (a) Define Local field in a dielectric. Obtain an expression for the internal field in dielectric and hence Deduce Clausius-Mosotti equations. (16)

Or

(b) Describe various breakdown mechanisms takes place in dielectrics. (16)

15. (a) What are SMA's? Describe Shape memory effect. Write down 4 applications of SMA's. (16)

Or

(b) What are nano materials? How nano materials are synthesised by sol gel and ball milling technique? (16)