C 3363

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Mechanical Engineering

PH 1153 — PHYSICS — II

(Common to Aeronautical, Automobile, Marine, Mechatronics, Metallurgical and Production Engineering)

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Explain twin boundary in a crystal.

2.   What are the factors which affect creep resistance materials?

3.   Define drift velocity of electrons.

4.   How are n-type and p-type semi-conductors produced?

5.   The saturation magnetic induction of nickel is 0.65 wb/m². If the density of nickel is 8906 kg/m³ and its atomic weight is 58.7, calculate the magnetic moment of the nickel atom in Bohr magneton.

6.   Explain electro chemical breakdown in dielectric.

7.   What is the binding energy of a nucleus?

8.   What are the three general approaches to the management of radioactive waste?

9.   Explain the term critical magnetic field in superconductor.

10.   A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K.

PART B — (5 × 16 = 80 marks)

11. (a) Describe with suitable diagram, edge dislocations and screw dislocations in crystal lattice. What is Burger's vector?

Or

(b) Explain how impact test is carried out. Compare plane strain fracture toughness test with impact test.

12. (a) Write Fermi-Dirac distribution function. Explain how Fermi function varies with temperature?

Or

(b) Give the theory of Hall effect. Using that effect how will you determine the electrical conductivity of a semiconductor.

13. (a) Derive an expression for the magnetic moment M of a paramagnetic solid on the basis of quantum theory.

Or

(b) Obtain an expression for the frequency dependence of the electronic polarizability and show that the imaginary part of the polarizability gives rise to absorption of energy by the system from the field.

14. (a) Give the theory of liquid drop model and explain how does it explain nuclear fission.

Or

(b) Describe the construction and working of power reactor.

15. (a) Write an essay on superconducting materials and its applications. What are the new developments?

Or

(b) (i) What are nanophase materials? Explain how the physical properties vary with geometry.

(ii) What are shape memory alloys?