Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

J 3385

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Second Semester

(Regulation 2004)

Mechanical Engineering

PH 1153 — PHYSICS — II

(Common to Aeronautical Engineering/Automobile Engineering/
Mechatronics Engineering and Production Engineering)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by crystal imperfections?

2. Distinguish between brittle and Ductile Fractures.

3. State law of mass action.

4. What is a hole in a semiconductor and how is it formed?

5. What is Bohr Magneton?

6. What is meant by polarisation in dielectrics?

7. What is meant by critical size of a nuclear rector?

8. Give the principle of Bubble Chamber.

9. Define critical magnetic field and write the relation between critical field and critical temperature.

10. What is micro electronic system?

11. (a) (i) What is meant by point defects in crystal lattice? What are the different types of point defects? How are they caused? (10)

   (ii) The density of Schottky defects in sodium chloride is $5 \times 10^{11} \, m^{-3}$ at 300 K. If the interionic seperation is 2.82Å, what is the average energy required to create one Schottky defect. (6)

Or

(b) (i) Give the strengthening mechanism for the improvement of mechanical properties. (6)

   (ii) Give Griffiths theory of brittle fracture. (8)

   (iii) Define Tensile compression and fatigue. (2)

12. (a) (i) Define Fermi energy and obtain a general expression for the Fermi energy of electrons in solids at zero degree kelvin. (12)

   (ii) Show that at the same temperature, the average energy of an electron is $\left(\dfrac{3}{5}\right)^{th}$ of the Fermi energy. (4)

Or

(b) (i) Distinguish between intrinsic and extrinsic semiconductors. Obtain an expression for the carrier concentration for an intrinsic semi conductor. (8)

   (ii) What is Hall effect? Briefly discuss the physical origin of Hall effect. What are the uses of this effect? (8)

13. (a) (i) Give the theory of magnetic domains in a ferromagnetic materials. How are the domains experimentally determined? (12)

   (ii) A paramagnetic salt contains 10^{28} ions/m³ with magnetic moment of one Bohr magneton. Calculate the paramagnetic susceptibility and the magnetisation produced in a uniform magnetic field of 10^6 A/m at room temperature. (4)

Or

(b) (i) What is dielectric breakdown? Summarise the various factors contributing to breakdown in dielectrics. (6)

   (ii) Write an essay on various dielectric breakdown mechanism in insulator. (10)

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14. (a) (i) Give evidences for charge independence and exchange characteristics of nuclear force. (8)

(ii) Deduce Einsteins mass-energy relation. (8)

Or

(b) (i) Deduce four factor formula. (8)

(ii) Explain the construction and working of Linear accelerator. (8)

15. (a) (i) Give an account of phenomenon of super conductivity. Explain Type I and Type II superconductors. Write a note on the magnetic levitation. (3 + 3 + 6)

(ii) Calculate the critical current which can flow through a long thin super conducting wire of aluminium of diameter 10^{-3}m. The critical field for Aluminium is 7.9×10^3 A/m. (4)

Or

(b) (i) Describe the principle of a superconductive quantum device (SQUID). List out their uses and engineering applications. (8)

(ii) Give the properties and applications of Nano phase materials and shape memory alloys. (8)

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