S 4061

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Second Semester

Mechanical Engineering

PH 1153 — PHYSICS — II

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

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between point defects and dislocations.

2. Steel can withstand a much larger stress than pure iron. Why?

3. Write down the Fermi distribution function and outline its significance.

4. What is Hall effect?

5. Define ferromagnetic curie temperature.

6. What is meant by orientational polarisation?

7. Explain mass defect.

8. Show that 1 a.m.u $\left[1 \text{ a.m.u} = 1.66 \times 10^{-27} \text{ kg}\right]$ is equivalent to 931 MeV.

9. What is Meissner effect?

10. What are metallic glasses?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Compare brittle fracture with ductile fracture. (4)

    (ii) Outline Griffith's theory of brittle fracture and obtain an expression for fracture stress. (12)

Or

    (b) (i) Explain edge dislocation. (4)

    (ii) Outline any three methods of improving mechanical properties. (12)

12. (a) (i) Explain the variation of Fermi level with temperature and impurity concentration in a n-type semiconductor. (8)

    (ii) Explain any two applications of Hall effect. (8)

Or

    (b) (i) Write down an expression for the intrinsic carrier concentration. Explain electrical conduction in an intrinsic material. (8)

    (ii) Outline a method of determining the band-gap of a semiconductor. (8)

13. (a) (i) Explain electronic and ionic polarisations. (10)

    (ii) Explain dielectric loss. (6)

Or

    (b) (i) What are Ferromagnetic domains? Explain magnetic hysteresis on the basis of Ferromagnetic domains. (10)

    (ii) Write a note on magnetic bubble memories. (6)

14. (a) (i) Derive Einstein's mass-energy relation. (10)

    (ii) Explain the term binding energy. (6)

Or

    (b) (i) Explain the salient features of a nuclear power station. (10)

    (ii) Write a note on nuclear fusion. (6)

15. (a) (i) Distinguish between Type I and Type II superconductors. (8)

    (ii) Write a note on High T_c superconductors. (8)

Or

    (b) (i) Explain the characteristic features and applications of metallic glasses. (12)

    (ii) What are shape memory alloys? (4)

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