S 9273

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fourth Semester

Mechanical Engineering

PH 233 — APPLIED MATERIALS SCIENCE

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are "Schottky" and "Frenkel" defects?

2. Define "Age hardening" and "grain growth".

3. Distinguish between brittle and ductile fracture.

4. Draw the S-N cure of a material and explain it.

5. Mention four factors affecting mechanical properties of a material using grain size.

6. Differentiate between a steel and cast iron by giving two examples.

7. Mention the properties of high resistivity alloys.

8. What are cermets? Give its properties with example.

9. What are the advantages and disadvantages of surface heat treatment by thermal methods?

10. Distinguish between flame hardening and induction hardening.

PART B — (5 × 16 = 80 marks)

11. (a) Derive the C/a relation of a hexagonal close packed structure as 1.633. Find the packing factor for HCP structure.   (16)

Or

(b) Mention the effect of dislocations in determining the mechanical and electrical properties in solids. Discuss the strain hardening method to strengthen the metal.   (10 + 6)

12. (a) Explain the Griffith's theory on brittle fracture and derive a relation for fracture strength. (16)

Or

(b) Explain (i) The factors affecting fatigue strength. (8)

(ii) The factors influencing creep resistance. (8)

13. (a) (i) With a neat diagram, discuss the allotropic changes of pure iron. (6)

(ii) Explain the various properties of any six materials of microstructure of iron and steel. (10)

Or

(b) (i) Discuss the iron-carbon equilibrium diagram. (8)

(ii) Construct a T.T.T diagram and discuss its results. (8)

14. (a) (i) What are the various factors which affect the conductivity of conductors? (8)

(ii) Write a note on superhard materials. (8)

Or

(b) Derive the electrical conductivity of a metal using Drude-Lorentz theory. Obtain relation between electrical and thermal conductivity. (12 + 4)

15. (a) Explain the various surface heat treatments by diffusion methods and mention the advantages and disadvantages of it. (16)

Or

(b) Describe (i) The laser surface hardening and (ii) Vicker's hardness tester. (8 + 8)

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