[3762]-112

S.E. (Mech. and Mech. S/W) (First Semester) EXAMINATION, 2010

METALLURGY

(2008 PATTERN)

Time : Three Hours   Maximum Marks : 100

N.B. :—(i)   Answer any *three* questions from each Section.

(ii)   Answers to the two Sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv)   Figures to the right indicate full marks.

(v)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(vi)   Assume suitable data if necessary.

SECTION I

1.   Answer any *four* of the following :

(a)   Maximum shear stress is obtained in a single crystal during plastic deformation if slip plane is at 45°.   [4]

(b)   What is the role of dislocation in the plastic deformation of metal ?   [4]

(c) Explain strain hardening with the curve. [4]

(d) How plastic deformation in poly crystalline material is different from single crystal. [4]

(e) Differentiate between cold and hot working. [4]

Or

2. Answer the following :

(a) Distinguish between slip and twinning. [4]

(b) Why annealing is done after cold working ? Explain the changes in mechanical properties that take place during annealing with proper graphs. [6]

(c) Derive expression for critical resolved shear stress. Explain its significance. [6]

3. Answer the following :

(a) Explain the principle of ultrasonic flow inspection. State its advantages, limitations and applications. [6]

(b) Explain the experimental process for the fatigue test. State significance of S–N curves for mild steel and aluminium alloys. [6]

(c) Define the following : [4]

   (i) Modulus of toughness

   (ii) Ductility

   (iii) Yielding

   (iv) Modulus of resilience.

4. (a) Define hardness. State *two* limitations of the following hardness tests :

   (i) Brinnel hardness test

   (ii) Vickers hardness test

   (iii) Microhardness test. [4]

   (b) Draw the standard IS specimen for charpy and Izod impact tests. Explain the significance of notch. [6]

   (c) Define creep. Explain the creep behaviour of materials with creep curve. How is material selected from creep curve ? [6]

5. (a) A slowly cooled plain carbon steel shows proeutectoid ferrite to be 10% by weight of the microstructure. What is the carbon percentage of the steel ? [4]

   (b) What is proeutectoid ferrite and proeutectoid cementite. Discuss the correlation between shapes and hardness of proeutectoid ferrite and proeutectoid cementite. [5]

   (c) State properties and composition of dual phase steels. Explain the method of obtaining dual phase steel. [5]

   (d) Explain the factors increasing the strength and hardness of HSLA. [4]

Or

6. Answer the following :

(a) Explain how pearlitic malleable iron is produced. State properties and applications of pearlitic malleable iron. [6]

(b) Classify the steels on the basis of :

   (i) Carbon percentages

   (ii) Degree of deoxidation

   (iii) Depth of hardening. [6]

(c) Compare and contrast between ferritic austenitic and martensitic stainless steels. [6]

SECTION II

7. Answer the following questions :

(a) Draw the microstructures of :

   (i) Annealed 0.8% C steel at 500X

   (ii) Spherodised steel at 100X

   (iii) Quenched 0.8% C steel at 500X. [6]

(b) Compare liquid and gas carburising. [6]

(c) Draw TTT curve for eutectoid steel. Explain the procedure for plotting TTT curve for 0.8% C steel. [6]

Or

8. Answer the following questions :

   (a) State True *or* False. Justify (any *two*) : [6]

      (i)   Lathe beds are flame hardened

      (ii) 0.1% carbon steel can be induction hardened

      (iii) Only Nitralloys can be effectively nitrided.

   (b) Explain the transformation of austenite into pearlite, martensite and bainite. [6]

   (c) Describe Jominey End Quench Test and explain its significance in heat treatment. [6]

9. Answer the following questions :

   (a) Enlist the powder production techniques for powder metallurgy. Explain any *one* technique in brief. [4]

   (b) Is sintering mandatory in P/M technique ? Justify in brief. [4]

   (c) Describe the effect of increasing zinc content on the properties of brasses. [4]

   (d) 'Aluminium alloys are widely used in aeronautic and automobile applications.' Comment. [4]

10. Answer the following questions :

(a) State the advantages and limitations of powder metallurgy over the other manufacturing processes. [4]

(b) Write a short note on 'self-lubrication bearing'. [4]

(c) Give composition, uses and properties of the following alloys (any *two*) : [4]

    (i) LM-11

    (ii) Naval brass

    (iii) Y-alloy.

(d) Enlist the properties required for the material to be bearing material. Write brief note on Babbitts. [4]

11. Answer the following questions :

(a) Write a detailed note on 'General Properties of Ceramics'. [6]

(b) Classify the composites on the basis of reinforcement. [4]

(c) Write a note on 'Applications of Alumina, Berylia, Ziroconia'. [6]

Or

12. Answer the following questions :

(a) Give *five* areas of applications of ceramics in industries. Give specific name of ceramics being used and appropriate property which makes it suitable. [8]

(b) Explain the characteristics of the following fibers used in composites (any *two*) : [4]

   (*i*) Carbon

   (*ii*) Glass

   (*iii*) Aramide.

(c) Explain hybrid composites. [4]