Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

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S.E. (Mechanical) (I Sem.) EXAMINATION, 2011

METALLURGY

(Common to Sandwich)

(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. Solve the following :

(*a*) Define recrystallization and recrystallization temperature. Explain the factors affecting recrystallization process. [6]

(*b*) Explain the following crystalline defects with sketches :

(*i*) Point defects

(*ii*) Line defects. [8]

(*c*) Distinguish between Slip and Twinning. [4]

P.T.O.

Or

2. Solve the following :

(*a*) Explain the effect of grain size on mechanical properties of materials. [4]

(*b*) Explain the phenomenon of strain hardening with the curve. [4]

(*c*) Distinguish between hot and cold working. [4]

(*d*) Comment on the effect of crystal structure on the plastic deformation of materials. What is the role of dislocations during plastic deformation ? [6]

3. Solve the following :

(*a*) Define the following and show on stress-strain curve of M.S. :

(*i*) Yield stress

(*ii*) Ductility

(*iii*) Modulus of toughness

(*iv*) Modulus of resilience. [8]

(*b*) Explain the principle of ultrasonic flow inspection and state its applications. [4]

(*c*) Explain the standard creep curve and state its use. [4]

Or

4. Solve the following :

(*a*) Suggest suitable hardness testing method for the following and give justification. (Any *four*) :

(*i*) Pearlite phase

(*ii*) Lathe bed

(*iii*) Rubber sole of shoe

(*iv*) Self-lubricating bearings

(*v*) Cutting tools. [8]

(*b*) Explain with neat sketch the fatigue test in detail. [6]

(*c*) Explain the principle of Radiography. [2]

5. Solve the following :

(*a*) Explain the following transformations with neat sketches :

(*i*) Eutectoid

(*ii*) Eutectic. [6]

(*b*) Explain the factors affecting graphitization of cast iron. [4]

(*c*) What is pearlite ? Explain the co-relation between grain size of pearlite and mechanical properties. [4]

(*d*) Explain the "weld decay" phenomenon. [2]

Or

6. Solve the following :

(*a*) Draw Fe-Fe_3C phase equilibrium diagram. Label all phases, temperatures and critical lines. State the use of Fe_3-Fe_3C diagram. [6]

(*b*) Draw microstructures of Gray and Malleable cast irons. [4]

(*c*) State composition, properties and applications of maraging steel. [4]

(*d*) Explain the effect of silicon on microstructure and mechanical properties of cast iron. [2]

SECTION II

7. Solve the following :

(*a*) Draw the microstructures of the following and state their applications (any *three*) :

(*i*) Annealed 0.2% carbon steel

(*ii*) Normalised 0.2% carbon steel

(*iii*) Hardened and tempered tool steel

(*iv*) 0.8% C steel. [6]

(*b*) Draw TTT curve for 0.8% carbon steel and explain the following treatments :

(*i*) Martempering

(*ii*) Austempering. [8]

(*c*) Explain the pack carburizing process. [4]

Or

8. Solve the following :

(*a*) Explain the following heat treatments (any *three*) :

(*i*) Annealing

(*ii*) Normalising

(*iii*) Spheroidizing

(*iv*) Hardening and tempering. [6]

(*b*) Explain the crystal structure and properties of martensite. [6]

(*c*) Distinguish between the following :

(*i*) Carburising and Nitriding

(*ii*) Flame and Induction hardening. [6]

9. Solve the following :

(*a*) List the powder production processes and explain any *one* of them. [4]

(*b*) Explain characteristics of metal powder. [4]

(*c*) State advantages and applications of powder metallurgy technique. [4]

(*d*) Distinguish between brass and bronze. [4]

Or

10. Solve the following :

(*a*) State the non-ferrous alloys for the following components and justify (any *three*) :

(*i*) Cartridge cases

(*ii*) Heat exchanger tubes

(*iii*) Piston

(*iv*) Water tap. [6]

(*b*) Explain the production of self-lubricating bearings. [4]

(*c*) Explain the following terms :

(*i*) Sintering

(*ii*) Compacting

(*iii*) Green strength. [6]

11. Solve the following :

(*a*) Give the classification of composites based on reinforcing material and matrix material. Explain the polymer matrix composites with *one* example. [6]

(*b*) Write a note on dispersion strengthened composites and state the applications. [6]

(*c*) State properties and applications of refractories. [4]

Or

12. Solve the following :

(*a*) Explain the effects of high working temperatures on mechanical properties of materials. State *two* examples. [5]

(*b*) Explain the effects of cryogenic temperatures on mechanical properties of materials. State *two* examples. [5]

(*c*) Compare between the following (any *two*) :

(*i*) Hybrid and non-hybrid composites

(*ii*) Flake and particulate composites

(*iii*) Whisker reinforced and fiber reinforced composites. [6]