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

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S.E. (Mech. & Mech. Sand) (First Semester) EXAMINATION, 2010

METALLURGY

(2008 COURSE)

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 the following :

(*a*) Define cold working. Draw microstructure of mild steel before and after cold working. Why cold worked materials are annealed ? [6]

P.T.O.

(*b*) Give reasons (any *three*) : [9]

(*i*) Aluminium shows higher ductility than steel.

(*ii*) Fine grained steels are stronger than coarse grained steels.

(*iii*) Substitutional and interstitial crystal defects improve the strength and hardness.

(*iv*) Dislocations play an important role during plastic deformation of metals.

(*c*) Define slip plane and slip direction. [3]

Or

2. Answer the following :

(*a*) Give the classification of crystal imperfections. Explain with neat sketches screw dislocation and volume defects. [8]

(*b*) Define the recrystallization temperature and work hardening. Why are alloys worked hardened during plastic deformation ? [5]

(*c*) Obtain effective number of atoms per unit cell for cubic unit cells and state its significance. [5]

3. Answer the following :

(*a*) Define engineering and true stress. Obtain the relationship between engineering stress, strain and true stress, strain. [6]

(*b*) Draw a neat sketch of creep testing m/c and explain the test procedure. Draw the standard creep curve. [7]

(*c*) Explain the significance of Endurance limit. [3]

Or

4. Answer the following :

(*a*) With a neat sketch explain the procedure for Rockwell hardness test. State *two* main differences between Brinnel and Rockwell hardness tests. [7]

(*b*) Give the reason (any *three*) : [9]

(*i*) Specimens are notched in impact test.

(*ii*) Ultrasonic flaw inspection is not suitable to detect the defects in thin materials.

(*iii*) Magnaflux test is used to detect surface and subsurface defects.

(*iv*) Radiography is used to detect the defects in welded joints of boilers.

(*v*) Eddy current test can be used for sorting the steels.

5. Answer the following :

(*a*) Draw Fe-Fe_3C phase equilibrium diagram and label completely. Explain the phases, critical temperatures and phase transformation reactions. [10]

(*b*) State the requirements of steels used for various tools. Explain the significance of chromium and vanadium in tool steel. [6]

Or

6. Answer the following :

(*a*) Draw the microstructures and state the properties and applications of the following : [6]

(*i*) S.G. iron

(*ii*) Grey cast iron.

(*b*) Give the significance of the following (any *two*) : [6]

(*i*) En353

(*ii*) AISI1040

(*iii*) C45

(*c*) Explain free cutting steels w.r.t. composition and machinability. [4]

SECTION II

7. Answer the following :

(*a*) Define annealing and normalising. Explain any *three* annealing treatments with the use of proper portion of Fe-Fe_3C phase equilibrium diagram. [9]

(*b*) Define hardenability. Draw standard Jominey hardenability test set-up. Draw hardenability curves for 0.4% carbon and 0.8% carbon steels. Explain the significance of hardenability curves. [7]

(*c*) Give *four* differences between flame and induction hardening. [2]

Or

8. Answer the following :

(*a*) Draw TTT curve for 0.8% carbon steel. How are TTT curves used for the annealing, normalising and hardening treatments. [8]

(*b*) Explain the principle of carburising and nitriding. [4]

(*c*) State the characteristics of martensite and tempered martensite. Why are tool steels multitempered ? [6]

9. Answer the following :

(*a*) Explain the following characteristics of metal powder : [6]

(*i*) Particle size and shape distribution

(*ii*) Flow rate

(*iii*) Apparent density.

(*b*) Explain the effect of the following variables on metal powder characteristics in atomisation method : [6]

(*i*) Atomising pressure

(*ii*) Nozzle geometry

(*iii*) Pouring temperature.

(*c*) Draw Al-Si phase transformation diagram and give eutectic phase transformation reaction. [4]

Or

10. Answer the following :

(*a*) Define sintering. Why Briquettes need sintering treatment ? Explain the sintering process used for cemented carbide tools. [6]

(*b*) Explain the blending and compacting processes. [4]

(*c*) Explain anodising used for aluminium alloys. [3]

(*d*) Distinguish between brass and bronze. [3]

11. Answer the following :

(*a*) Explain the basic characteristics required to produce good composites. [4]

(*b*) Explain the properties and applications of the following fibers : [8]

(*i*) Aramid

(*ii*) Glass

(*iii*) Graphite

(*iv*) Alumina

(*v*) Silicon.

(*c*) State and explain usual problem that occur at cryogenic temperature. [4]

Or

12. Answer the following :

(*a*) Explain the characteristics of high temperature materials. [3]

(*b*) State any *one* material used for the turbine and give the reason. [4]

(*c*) Give classification of refractories. State properties and applications of each type of refractories. [7]

(*d*) Give classification of silicate glass. [2]