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S.E. (Mechanical/Automobile/Mechanical S/W) (First Semester)

EXAMINATION, 2015

METALLURGY-I

(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) Figures to the right indicate full marks.

(iv) Draw the neat sketch whenever necessary.

SECTION I

1. (a) What is recrystallization ? Explain the factors affecting recrystallization process. [4]
- (b) Explain the phenomenon of strain hardening in detail. [4]

P.T.O.

(c) Represent the following planes and directions in cubic system
(any two) : [4]

(i) [112]

(ii) (111)

(iii) (221).

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

Or

2. (a) Differentiate between the following (any one) : [4]

(i) Slip and Twinning

(ii) Hot and cold working.

(b) Derive the equation for critical resolve shear stress during slip in a single crystal. [4]

(c) How plastic deformation in polycrystalline material is different from single crystal ? [4]

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

3. (a) What is creep ? In which applications should it be considered ?
How is the creep resistance improved ? [4]

- (b) Define the following : [4]
- (i) Modulus of toughness
 - (ii) Ductility
 - (iii) Yielding
 - (iv) Modulus of resilience.
- (c) Define fatigue limit. Explain the processes used to improve fatigue life. [4]
- (d) Vickers Hardness Test with reference to load, indenter, formula and application. [4]

Or

4. (a) Draw the standard IS specimen for Charpy and Izod impact tests. [4]
- (b) Why are impact test specimens notched ? What is the effect of temperature on impact strength ? [4]
- (c) Obtain the relationship between engineering stress, strain and true stress, strain. [4]
- (d) With a neat sketch explain the procedure for Rockwell hardness test. [4]

5. (a) Draw neatly labeled Fe-Fe₃C diagram and explain the three reactions associated with it. [6]
- (b) Draw and label microstructures of hypoeutectoid steel, eutectoid steel and hypereutectoid steel. [6]
- (c) What are the types of stainless steels ? Explain about weld decay in stainless steels. [6]

Or

6. (a) Enlist all the types of cast iron and give *two* applications of each type. Explain the manufacturing of *one* of them. [6]
- (b) What is critical temperature ? What do you understand by A₀, A₁, A₂, A₃ and A_{cm} ? [6]
- (c) Classify the steels on the basis of : [6]
- (i) Carbon percentages
 - (ii) Degree of deoxidation
 - (iii) Depth of hardening.

SECTION II

7. (a) What are the advantages and limitations or disadvantages of nitriding over carburising ? [6]
- (b) Write a detailed note on : "Transformation Products of Austenite". [6]

(c) Draw TTT diagram and show the following heat treatment cycles on it : [6]

(i) Martempering

(ii) Austempering

(iii) Hardening.

Or

8. (a) What is Tempering ? Is it mandatory ? With a suitable graph, explain the variations in properties with tempering temperature. [6]

(b) Why is carburizing performed at higher temperature and nitriding at lower temperature ? [6]

(c) What is hardenability ? Explain any *one* method of evaluating it. Discuss the factors influencing hardenability. [6]

9. (a) Explain the automatization process of powder manufacturing with neat sketch. [4]

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

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

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

Or

10. (a) Enlist the types of brasses. Explain any *one*. [4]

(b) Give composition, properties and application of the following metals : [4]

(i) Gun metal

(ii) Muntz metal.

(c) What are the advantages and limitations of Powder Metallurgy Process ? [4]

(d) Write short note : Electrical contact materials. [4]

11. (a) Write short note on Shape Memory Alloys. [4]

(b) Write short note on : Ferrites. [4]

(c) Write short note on : Cryogenic materials. [4]

(d) Explain with suitable example Nano materials. [4]

Or

- 12.** (a) Hybrid and non-hybrid composites. [4]
- (b) Write a note on dispersion strengthened composites and state the applications. [4]
- (c) Explain the effects of cryogenic temperature on mechanical properties of materials. [4]
- (d) Explain different types of biomaterials. [4]