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

Seat No.	

[4757]-113

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-Fe_3C 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 A_0, A_1, A_2, A_3 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 envaluating it. Discuss the factors influencing hardenability. [6]

9. (*a*) Explain the automization 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]