[4062]-134

S.E. (Production & Production Sandwich)

(First Semester) EXAMINATION, 2011

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

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

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

(*iii*) Neat diagrams should 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 required.

SECTION I

1. (*a*) Derive the expression for critical resolved shear stress of a single crystal. [4]

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

 (*c*) Show the following planes and directions in a cubic cell : [4]

 (100), (101)

 (*d*) What is composite material ? Explain its basic types with minimum *one* example. [6]

P.T.O.

2. (*a*) State various imperfections in crystals. Explain point defect in detail. [4]

(*b*) What is strain hardening ? Explain the variations in mechanical properties with a graph. [5]

(*c*) What are the mechanisms of plastic deformation ? Explain. [4]

(*d*) What is steel ? Explain classification of steels based on % carbon with its mechanical properties and minimum one use of each type. [5]

3. (*a*) Write a short note on Microhardness tester. [4]

(*b*) Draw self-explanatory diagram for the following : [4]

(*i*) S-N diagram for low carbon steel

(*ii*) Stress-strain diagram for Cu.

(*c*) Write a short note on magnetic particle test. [5]

(*d*) FCC metals are more ductile than BCC metal. Explain. [3]

Or

4. (*a*) Suggest suitable hardness tester for the following applications and explain in brief : [9]

(1) Gray cast Iron plate

(2) Razor blade

(3) Ferrite phase in steel

(*b*) Explain X-ray radiography with neat diagram, advantages, disadvantages and application. [4]

(*c*) Write a short note on Brinell hardness tester. [3]

5. (*a*) The atomic radii of Al is 0.143 nm and Si is 0.117 nm respectively. Is it possible to form solid solution ? Explain. [4]

(*b*) Undercooling is necessary for pure metals. Explain. [2]

(*c*) What are the uses of eutectic alloys. [2]

(*d*) Two materials A and B are having 100% solubility in each other in liquid as well as in solid phase. Plot an equilibrium diagram from the given data and discuss slow cooling of 35% alloy from its liquidus temperature to room temperature.

Wt. of B	Liquidus Temperature °C	Solidus Temperature °C
0	1084	1084
20	1200	1165
40	1275	1235
60	1345	1310
80	1440	1380
100	1455	1455 [8]

Or

6. (*a*) What is Gibbs phase rule ? Explain it with reference to cooling cure   for   eutectic   alloy. [4]

(*b*) What do you understand by non-equilibrium cooling. What are its   effects   on   eutectic   transformation ? [4]

(*c*) Define   the   following : [2]

(1) Phase

(2) Solid Solution.

(*d*) Draw an equilibrium diagram for materials having no solubility in liquid as well as in solid state. [3]

(*e*) What is coring ? Explain the factors responsible for coring. [3]

SECTION II

7. (*a*) Is grain refinement is strengthening Mechanism ? Explain in brief. [4]

(*b*) Explain with neat diagram working and principle of Resistance pyrometer. [5]

(*c*) Strengthening by precipitation is not possible for every alloy. Explain. [4]

(*d*) Explain the principle and working of total radiation pyrometer. [5]

8. (*a*) Write short notes on : [16]

   (*i*) Thermocouples

   (*ii*) Martensitic transformation

   (*iii*) Age hardening

   (*iv*) Disappearing filament pyrometer

   (*b*) What is Hall-Petch equation ? [2]

9. (*a*) Write short notes on : [8]

   (*i*) Physical vapour deposition

   (*ii*) Thermal spray coating

   (*b*) Corrosion can be controlled by controlling the atmosphere. Explain. [4]

   (*c*) Explain cathodic protection. [4]

Or

10. (*a*) Design of component can prevent corrosion of metal ? Explain with examples. [6]

   (*b*) Explain electroplating. [4]

   (*c*) Write a short on anodising. [4]

   (*d*) What is anodic coating ? [2]

11. (*a*) What is powder metallurgy ? Compare its advantages and disadvantages over other conventional processes. [6]

(*b*) Explain chemical processes of powder manufacturing. [4]

(*c*) Define the following : [2]

(1) Apparent density

(2) Green strength

(*d*) What is sintering ? Explain its stages. [4]

Or

12. Write short notes on : [16]

(1) Manufacturing of cemented carbides

(2) Manufacturing of self-lubricating bearing.

(3) Mechanical processes in powder manufacturing (min. 3 methods)

(4) Compaction process.