B.Tech. SEM -IV Mechanical 2014 Course (CBCS) : WINTER - 2018
SUBJECT : MATERIAL SCIENCE

Day : Thursday
Date : 15/11/2018

W-2018-2359

Time : 02.30 PM TO 05.30 PM
Max. Marks : 60

N. B. :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary
4) Assume suitable date if necessary.

Q. 1 **a)** What is slip? Why plastic deformation does occurs by slip? Give typical slip planes and directions for F.C.C. and B. C.C. metals. **(05)**

b) Find the number of atoms/cm^2 along the (101) and (010) planes for Au metals if the center of interatomic distance of close atoms is = 4.14^0A. **(05)**

OR

a) What is cold working and hot working? In which respect the cold working is superior to hot working? **(05)**

b) Calculate the X-Ray density of Fe atoms at room temperature if radius = 1.84 A^0. Atomic weight = 63.48 gm/mole.
N is 6.02×10^{23} atoms/ mole. **(05)**

Q. 2 **a)** What is creep? In which applications it should be considered? How is the creep resistance improved? **(05)**

b) Draw self explanatory sketches for following: **(05)**

i) Indenters in Rockwell hardness test
ii) S.N. curves
iii) True stress strain curves for M.S.
iv) Impression in Vickers hardness test.
v) Transient temperature curve

OR

a) Find out the hardness no. from following data: **(05)**

i) Load P = 120 kg square impression d_1 = 0.321 and d_1 = 0.323mm
ii) Circular impression of diameter d = 4.31 mm under the ball indentor 10 mm size if load is 160 kg.

b) Explain the principle of ultrasonic inspection methods? Write its applications. Give their advantages and limitations. **(05)**

Q. 3 **a)** What are solid solutions? What are its different types? State the factors affecting solid solubility? **(05)**

b) Draw a partial eutectic system diagram and show cooling of one hypo eutectic alloy and one hyper eutectic alloy from high temperature to low temperature with suitable sketches. **(05)**

OR

P. T. O.

a) Draw equilibrium diagram from following information. Melting point of element B is 750^0C. Melting point of element A is 880^0C. Both element at 70 % A and 30 % B mixed get melt at 600^0C. Find the amount of free A % at 20 % B. by use of lever rule. **(05)**

b) Explain the non-equilibrium cooling. What are the effects observed due to non-equilibrium cooling? **(05)**

Q. 4 a) What is steel? What do you understand by eutectoid, hypoeutectoid and hypereutectoid steel? **(05)**

b) Explain the nodular cast iron with its chemical composition micro structural properties, applications and production methods. **(05)**

OR

a) What is malleable cast iron? Draw their microstructures. **(05)**

b) Give the different specifications of steels. **(05)**

Q. 5 a) Describe the effect of increasing zinc content on the properties of brasses. **(05)**

b) Explain any two copper-nickel alloys with respect to the composition, properties and application. **(05)**

OR

a) Classify various aluminum alloys. What is the effect of alloying element on properties of aluminum? **(05)**

b) What is the major area of applications of Babbits? Why? **(05)**

Q. 6 a) What is season cracking? Is it major problem in brass components? **(05)**

b) What are the criteria for material selection in view of corrosion prevention? **(05)**

OR

a) What are the different methods of vapour deposition? Explain any one in details. **(05)**

b) Distinguish between the following hydrogen absorption and oxidation in corrosion. **(05)**

* * * * *