BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - IV MECHANICAL :SUMMER- 2022
SUBJECT : MATERIAL SCIENCE

Day : Monday
Date : 20-06-2022

S-12737-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1 All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non – programmable **CALCULATOR** is allowed.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 **a)** Draw the crystallographic plane and directions if miller indices are as follows **(05)**
(0 1 0), (0 1 1), (2 2 1) (1 1 0)
How the number of atoms per unit cell are calculated.

b) What is mean by slip plane? How the plastic deformation occurs along the slip plane? Draw slip plane in F. C. C, structure. **(05)**

OR

a) Find out the theoretical density of element 'A' If it shows F. C. C. arrangement and distance between the two corner atoms are = 2.31 A^0 While atomic weight is = 34.5 gm/cm^3 and N = 6.02×10^{23} atoms / mol **(05)**

b) What is strain Hardening? On what factors it depends? How can it be minimized. **(05)**

Q.2 **a)** What is meant by B. H. N.? How it is calculated? Give its advantages and limitations also. **(05)**

b) Suggest suitable testing mechanism for following components **(05)**

i) Hardness of copper block
ii) Subsurface crack in Cu block
iii) Oxide inclusion in welded steel specimen
iv) Strength of brass sheet
v) Surface cracks on glass materials

OR

a) Explain the mechanism of creep deformation. Draw creep curves. How the creep strength is improved. **(05)**

b) Draw with neat sketch, mechanism of ultrasonic inspection. Give its limitations. **(05)**

Q.3 **a)** Write the different types of solid solution. Give the Hume Rothery's rule for complete solid solubility. **(05)**

b) Draw the equilibrium diagram from following data: **(05)**
Melting point of element 'A' is 210^0 C
Melting point of element 'B' is 420^0 C
Both element shows complete solubility in liquid state and insolubility in solid state
Point 'E' is at 180^0C with 55 % B
Show the cooling of 70% B alloy from high temperature to room temperature and calculate the phases at room temperature.

P.T.O.

OR

a) Write following reactions with respect to equilibrium diagram. **(05)**
i) Eutectic ii) Eutectoid
Where the eutectic alloys are useful

b) Calculate the amount of 'α' phase and draw the structure also at 30% B If element 'A' is melted at 490^0C and shows solubility 12% in 'B' at room temperature while element 'B' is melted at 395^0C and shows solubility in 'A' is 8% only. Both element shows 20% maximum solubility in each other at 300^0C and eutectic point is 60%B. **(05)**

Q.4 **a)** Give the different types of classification and specifications of steels. **(05)**

b) Draw the micro structure of Ductile cast iron. Give the chemical composition and applications. **(05)**

OR

a) Write the three reactions in Iron – Iron carbide equilibrium diagram. **(05)**

b) Distinguish between **(05)**
i) White cast Iron and Grey cast Iron
ii) Malleable cast Iron and S. G. Iron

Q.5 **a)** Draw the Cu – Zn equilibrium diagram and list out the brasses. **(05)**

b) How Cu – Be is hardened. Explain the detail process and its applications. **(05)**

OR

a) Give the difference between brasses and bronzes. **(05)**

b) Write the applications and compositions of following non – ferrous alloys **(05)**
i) LM 6
ii) Gun – metal
iii) Gilding metal
iv) Duralumin
v) Silicon bronze

Q.6 **a)** With neat sketch explain the Hydrogen embrittlement phenomena. **(05)**

b) With suitable example, write any one method for cathodic – prevention of corrosion. **(05)**

OR

a) What is meant by stress corrosion? How it is minimized. **(05)**

b) Elaborate with applications chemical vapor deposition method for corrosion prevention. **(05)**

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