CBCS Scheme

USN | | | | | | | | | | 15AU32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. Define co-ordination number and APF. Calculate APF for typical BCC structure. **(07 Marks)**
b. Differentiate between edge dislocation and screw dislocation. **(04 Marks)**
c. List and explain the factor affecting diffusion. **(05 Marks)**

OR

2 a. What do you mean by linear elastic properties? Explain briefly linear elastic properties. **(05 Marks)**
b. Define critically resolved shear stress (CRSS)? Obtain an expression for CRSS, showing force diagram. **(07 Marks)**
c. Differentiate between slip and twinning. **(04 Marks)**

Module-2

3 a. With the help of transition curve, explain ductile to brittle transition. **(04 Marks)**
b. With the help of neat sketches, explain type II and type III fractures. **(05 Marks)**
c. Draw typical creep curve. Explain its stages. **(07 Marks)**

OR

4 a. Define stress relaxation. Obtain an expression for stress relaxation. **(08 Marks)**
b. With the help of SN diagram explain fatigue test to determine the fatigue strengths of a material. **(08 Marks)**

Module-3

5 a. With neat sketch explain the different cast metal structures. **(04 Marks)**
b. Define solid solution. Explain different types of solid solutions. **(07 Marks)**
c. Explain Hume – Rothary rules for the formation of substitutional solid solution. **(05 Marks)**

OR

6 a. State and explain Gibb's phase rule and lever rule. **(04 Marks)**
b. Draw Iron – carbon diagram. Label its phase fields. Explain eutectic, eutectoid and peritectic reaction occur in Fe – Fe_3C diagram. **(12 Marks)**

Module-4

7 a. Draw a schematic TTT diagram for 0.8% C steel label all the regions and super impose the cooling curves which represents : i) Transformation of austenite is to coarse pearlite ii) CCR iii) Transformation of austenite into 100% Bainite. **(08 Marks)**

b. With neat sketch, explain briefly pack carburizing heat treatment. List its merits and demerits. **(08 Marks)**

OR

8 a. Give composition, properties and uses of Grey cast iron and S.G iron. **(06 Marks)**

b. Wire a note on AISI designation of steel. **(04 Marks)**

c. Give the list of various aluminum alloys. Write a brief note on them. **(06 Marks)**

Module-5

9 a. Define composite. Explain Hand lay-up and filament winding processes employed for the production of FRP's. **(11 Marks)**

b. List the advantages and applications of composites. **(05 Marks)**

OR

10 Write a note on :

a. Shape memory alloys

b. Biological applications of smart materials

c. Selection of materials

d. Use of NDT for materials. **(16 Marks)**

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