

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 – Fe₃C 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. Write 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)

* * * * *