

# CBCS SCHEME

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15AU32

## Third Semester B.E. Degree Examination, Dec.2018/Jan.2019 Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 80

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define Space lattice. Find out basic atoms and packing factors or packing densities for B.C.C and F.C.C. Draw concerned diagram. (08 Marks)  
b. Differentiate between edge and screw dislocations with sketches. (08 Marks)

OR

- 2 a. With the help of a neat conventional stress – strain diagram, explain the behaviour of mild steel, under static uniaxial, tension till fracture. (06 Marks)  
b. Draw the stress – strain curve for the following materials : i) Copper ii) Cast iron. (02 Marks)  
c. Explain Slip and twinning with figures. (06 Marks)  
d. Define : i) Resilience ii) Ductility. (02 Marks)

### Module-2

- 3 a. With the help of neat sketches, explain the different stages of ductile cup and cone fracture. (08 Marks)  
b. Define Creep. With a typical creep curve, explain the different stages of creep. (08 Marks)

OR

- 4 a. What is Fatigue? Draw and explain the SN curves for : (08 Marks)  
i) A material that displays a fatigue limit.  
ii) A material that does not display a fatigue limit.  
b. What are the various factors affecting fatigue strength? Explain. (08 Marks)

### Module-3

- 5 a. Define Solid solutions and explain different types of solid solutions with figures. (08 Marks)  
b. Explain the homogeneous nucleation. Discuss the significance of critical radius of the nuclei. (08 Marks)

OR

- 6 a. Explain with examples : i) Gibbs phase rule ii) Lever rule. (12 Marks)  
b. What are invariant reactions? With neat sketches, explain  
i) Eutectic reaction ii) Eutectoid reaction. (04 Marks)

### Module-4

- 7 a. Explain the construction of TTT diagram, with figure and label it. (08 Marks)  
b. Write a short note on the following heat treatment processes : (08 Marks)  
i) Annealing ii) Carburizing.

OR

- 8 a. Give the composition and uses of various cast – irons. (08 Marks)  
b. Write a note on Aluminum alloys. (08 Marks)

**Module-5**

- 9 a. Define Composite materials. Explain the role of matrix material in a composite. (04 Marks)  
b. What are the advantages and limitations of composite materials? (06 Marks)  
c. With a neat sketch, explain any one method for production of fibre reinforced plastic. (06 Marks)

**OR**

- 10 a. What are shape memory alloys? With a neat sketch, explain the stress – strain characteristics of SMA's as a function of temperature. (08 Marks)  
b. What are the biological applications of smart materials used as implants? (04 Marks)  
c. Write a note on use of non – destructive testing. (04 Marks)

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