

- (e) What is the influence of strain (cold work) hardening on properties of metals ?
- (f) Explain annealing operation on steel.
- (g) Give *two* applications for composite materials in biomedical applications and why ?
- (h) Why does metal degrade due to oxidation but ceramic not ?
- (i) What do you mean by creep rate ?
- (j) Why are glass materials brittle ? Explain.

10×2=20

Roll No.

Total Pages : 04

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B.Tech. EXAMINATION, 2022

Semester V (CBCS)

MATERIALS TECHNOLOGY (ME, AE)

ME-506

Time : 3 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. 9 is compulsory.

Section A

1. (a) Explain the basic process parameters used for the selection of materials. 5
- (b) Briefly explain about unit cell and Bravais lattice. Show Miller indices and direction of $[\bar{1}\bar{1}\bar{1}]$ and plane $(\bar{1}\bar{1}\bar{1})$ in a cubic cell. 5

2. What is Lever Rule ? Explain Time Temperature Transformation (TTT) diagram with a neat sketch and explain various transformations. 10

Section B

3. (a) Explain various factors which influence the heat treatment processes. 5
(b) Explain the mechanisms of strengthening in metals. 5
4. A 15 mm long and 120 mm dia cylindrical rod is subjected to a tensile load of 35 kN. It must not experience either plastic deformation or a diameter reduction of more than 0.012 mm. Which of the listed materials is suitable for such a requirement and why ? 10

Al ($E = 70$ GPa, $YS = 250$ MPa, $\nu = 0.33$)

Ti ($E = 105$ GPa, $YS = 850$ MPa, $\nu = 0.36$)

Steel ($E = 205$ GPa, $YS = 550$ MPa, $\nu = 0.27$)

Section C

5. (a) Discuss ceramics and polymer with reference to Young's modulus as the parameters of their design. 5

- (b) Justify the statement that ceramics are good heat resistant materials. 5

6. Write the difference between composite and alloy. Briefly explain about plastic and ceramics materials with its applications. 10

Section D

7. (a) Explain the impact of temperature and time on creep fracture. 5
(b) How to increase the fatigue life of the material ? 5
8. How to prevent the materials from corrosion ? Describe briefly the mechanism and types of corrosion. 10

(Compulsory Question)

9. (a) Difference between edge dislocation and screw dislocation.
(b) Draw the Fe-Fe₃C equilibrium diagram.
(c) How to measure the ductility of the materials ?
(d) Explain the mechanisms of plastic deformation of metals.