

Total Pages—4

(Set-T₁)

B.Tech-5th
Deformation Behaviour of Materials

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1
which is compulsory

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2 × 10
- (a) Define Burgers vector.
 - (b) Draw a stress-strain plot of an elastic-plastic material.
 - (c) In copper, (100) plane is perpendicular to [100] direction. True or False.
 - (d) What do you understand by a single crystal ?

(Turn Over)

(2)

- (e) How are cross slips formed ?
- (f) What is the need for flow curves of metals ?
- (g) How can you cause strain hardening of metals ?
- (h) Explain low angle grain boundaries.
- (i) Write down the expression for Von-mises criteria.
- (j) What are mechanical twins ?
2. (a) Derive the relation between true strain and engineering strain. 5
- (b) A force of 100,000 N is applied to a 10 mm × 20 mm iron bar having a yield strength of 400 MPa and a tensile strength of 480 MPa. Determine (i) whether the bar will plastically deform and (ii) whether the bar will experience necking. 5
3. (a) With a suitable diagram, explain Bauschinger effect in ductile metals. 5
- (b) Explain the significance of Schmid's law. 5

(3)

4. (a) What is the difference between slip and twinning? 5
- (b) Explain stacking faults in metallic systems. 5
5. (a) Differentiate between kinks, jogs and bands using neat sketches. 5
- (b) Explain the different stages in stress-strain diagram of a pure single crystal. 5
6. (a) Name four strengthening mechanisms in metallic system and explain any one of them. 5
- (b) Write down the Hall-Petch equation and state the limitation of the equation. 5
7. (a) How many grams of aluminium with a dislocation density of 10^{10} cm/cm³ are required to give a total dislocation length that would stretch from Sambalpur to Bhubaneswar (approx. 300 kms) ? Given density of Al = 2.7 g/cm³. 5
- (b) Give four differences between edge and screw dislocation. 5

(4)

8. Write short notes on any *two* : 5 × 2

(i) Peierls Nabarro stress

(ii) Tresca criterion

(iii) Luder bands.
