Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech
PCMT 4302

Fifth Semester Regular Examination – 2014
DEFORMATION BEHAVIOUR OF MATERIALS
BRANCH(S) : MM, MME
QUESTION CODE : H 155

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What is Cottrell atmosphere and it's Importance ?
   (b) What is the difference between grain boundary sliding and grain boundary strengthening ?
   (c) What is the difference between mechanical fibering and recrystallization texture ?
   (d) Tensile strength is used as a design criteria for brittle material. Justify.
   (e) What is Peierls-Nabarro force ?
   (f) What is the difference between solid solution strengthening and strain hardening ?
   (g) In routine tensile test, which yield point is measured and why ?
   (h) From what experimental measurement can the density of dislocation be deduced ?
   (i) How Luder's bands are formed ?
   (j) What is the difference between jog and kink ?

2 (a) What is solid solution strengthening ? How solute atoms interact with dislocation ? 5

   (b) A tensile specimen with 12 mm initial diameter and 50 mm gage length reaches maximum load at 90KN and fracture at 70KN. The minimum diameter at fracture is 10 mm. Determine engineering stress at maximum load and true fracture stress. 5

P.T.O.

3 (a) Describe the twinning process and the types of twinning. Differentiate between slip and twinning. 5

(b) In a cubic crystal with a lattice parameter a, show whether the following dislocation reaction is feasible or not. 5

$$\frac{a}{2}[110]+\frac{a}{2}[110]\rightarrow a[110]$$

4 (a) Describe the yield point behaviour of low carbon steel. 5

(b) A metal with an average grain size of 36 μm has yield strength 250 MPa and that with average grain size of 4 μm has yield strength 500 MPa. What is the friction stress of the material ? 5

5 (a) Explain the different mechanisms of dislocation multiplications. 5

(b) What is the difference between edge and screw dislocation ? Explain how cross slip and double cross slip occurs. 5

6 (a) Explain the Von Mises and Tresca yielding criteria for ductile metals. 5

(b) Derive the relationship between engineering stress and true stress and the relationship between engineering strain and true strain. 5

7 (a) Describe the strengthening which occurs from the presence of fine particles. 5

(b) What is the stress required to move a dislocation having burger vector 3Å through a matrix having shear modulus of 80 GPa and contain incoherent precipitate separated by an average distance of 0.3 μm. 5

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

(a) Bauschinger effect

(b) Stacking faults

(c) Partial Dislocations

(d) Strain aging