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

Total number of printed pages – 2

B. Tech

PCMT 4302

Fifth Semester Back Examination – 2014

DEFORMATION BEHAVIOUR OF MATERIALS

BRANCH (S) : MM, MME

QUESTION CODE : L 239

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. Fill up the blanks : 2×10
   (a) Engineering stress – strain curve for ceramic material is _____ .
   (b) The number of slip systems in ideal close packed hexagonal structure is _____ .
   (c) The yield point phenomenon observed in annealed low carbon steels is due to the presence of _____ .
   (d) Cross slip is prevalent in material with _____ stacking fault energy.
   (e) To obtain super plasticity, the alloy should have _____ grain structure and _____ at high temperature.
   (f) A truly sessile dislocation in FCC material is _____ .
   (g) Driving force for grain growth is _____ .
   (h) A mixed dislocation can be characterised by an angle between _____ and _____ .
   (i) In a _____ material, the yield stress and tensile strength are identical.
   (j) A low angle grain boundary occurs when the orientation difference between the adjacent grains is of the order of _____ .
2. (a) Describe the yield point phenomenon of low carbon steel. 5
   (b) Draw the generalized flow curve for fcc single crystals as proposed by Seeger and explain the various stages. 5

P.T.O.

3. (a) Explain dislocation climb. 5

(b) Explain the strengthening mechanism that occurs due to the presence of fine particles. 5

4. (a) Determine whether the following dislocation reaction is feasible : 5

$$\frac{a}{2}[1\,1\,0] \rightarrow \frac{a}{6}[2\,1\,\bar{1}] + \frac{a}{6}[1\,2\,1]$$

(b) A crystalline grain of a cubic metal plane is so oriented that a tensile load is along [111] direction of the crystal. If the applied stress is 0.8 MPa, calculate the resolve shear stress along the [101] direction within the $(1\,1\,\bar{1})$ plane. 5

5. (a) What are the different lattice defects ? Explain with suitable sketches the different types of point defects. 5

(b) Explain using suitable diagrams the different types of intrinsic and extrinsic stacking faults that are produced in most metals during plastic deformation. 5

6. Explain and compare slip in a perfect lattice with slip by dislocation movement. 10

7. (a) Explain through suitable diagrams the phenomena of strain aging. 5

(b) Differentiate and discuss on the tensile stress-strain plots observed for : metals, ceramics and polymers. 5

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

(a) Equicohesive temperature

(b) Hall Petch relation

(c) Polygonization

(d) Dislocation pile-ups.