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

Total number of printed pages – 2

B. Tech

PCMT 4201

Third Semester (Back / Special) Examination – 2013

INTRODUCTION TO PHYSICAL METALLURGY

BRANCH : MM, MME

QUESTION CODE : D 221

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which are 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 polymorphism ?

   (b) What do you mean by a unit cell ?

   (c) Explain the coordination number of BCC atom of the unit cell.

   (d) Define recrystallization temperature.

   (e) Define critical cooling rate.

   (f) What is dislocation ?

   (g) What is Hall-Petch relationship ?

   (h) Differentiate between hardness and hardenability of steel.

   (i) What is austempering ?

   (j) Draw (111) and [111] in a cubic unit cell.

2. (a) What is solid solution ? Discuss about Hume-Rothery rules. 5

   (b) Explain solid state phase transformation with an example. 5

P.T.O.

3. (a) Draw FCC and BCC unit cell and find out their atomic packing factor. 5

(b) Calculate the unit cell dimension and atomic diameter of Aluminium with FCC structure, density = 2.7 gm/cc and atomic weight = 26.98. 5

4. With a neat diagram describe about age hardening of Al-4.5 wt% Cu alloy. 10

5. (a) Explain with neat sketch the critical resolved shear stress. 5

(b) What is fatigue ? Draw the S-N curve for steel and Aluminium. 5

6. (a) Draw and compare the T-T-T curves for 0.5 and 1.0 wt% C steel. 5

(b) Define heat treatment and differentiate between annealing and normalizing. 5

7. (a) What is a phase ? Describe Gibb's phase rule for metallic and non-metallic systems. 5

(b) Explain the invariant reactions taking place in $Fe-Fe_3C$ phase diagram with suitable sketches. 5

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

(a) Graphitization

(b) Strain hardening

(c) Diffusion less transformation

(d) High speed steel.