Code: ME3T4

II B.Tech - I Semester–Regular/Supplementary Examinations November 2016

METALLURGY AND MATERIAL SCIENCE
(MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks
$$11 \times 2 = 22 \text{ M}$$

1.
   a) Define Hardenability.
   b) Calculate packing factor of Face Centered Cubic.
   c) Write any two types of Bravais lattices with diagrams.
   d) Write Gibbs Phase rule and explain the terms in it.
   e) Explain peritectic reaction in $Fe-Fe_3C$ equilibrium diagram.
   f) Write any four applications of low carbon steels.
   g) Draw the micro structure of Grey cast iron.
   h) What do you mean by sintering in powder metallurgy?
   i) Define Heat treatment and name various types of surface hardening processes.
   j) Explain Grain refinement.
   k) Write applications of composite materials.

PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2.
a) With neat sketches explain crystal imperfections.   8 M

b) Define grain growth and enumerate the factors on which it depends.   8 M

3.
a) Differentiate between substitutional and interstitial solid solutions with neat sketches.   6 M

b) With a neat sketch explain Fe-Fe$_3$C equilibrium diagram. Show invariant reactions on it.   10 M

4.
a) Explain types of cast irons with their micro structures and applications.   8 M

b) Classify steels based on carbon content and also write the properties and applications of them with micro structures.   8 M

5.
a) What is surface hardening? Name surface hardening processes. Explain any two of them in detail.   10 M

b) Write short notes on Strain hardening and Solid solution strengthening.   6 M

6.

a) Define Powder Metallurgy. Give advantages, limitations & applications of powder metallurgy.   6 M

b) Explain any three methods of manufacturing composites.   10 M