31100

311006

B. Tech. III Sem. (Main) Exam., Dec. - 2019

Mechanical Engineering

3ME4-06 Materials Science and Engineering

Time: 3 Hours **Maximum Marks: 120**

Instructions to Candidates:

Part – A: *Short answer questions (up to 25 words) 10 × 2 marks = 20 marks. All ten questions are compulsory.*

Part – B: *Analytical/Problem Solving questions 5 × 8 marks = 40 marks. Candidates have to answer five questions out of seven.*

Part – C: *Descriptive/Analytical/Problem Solving questions 4 × 15 marks = 60 marks. Candidates have to answer four questions out of five.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART - A

Q.1 What are Miller indices? How are they determined?

Q.2 What is elastic deformation?

Q.3 Discuss mechanism of crystallization.

Q.4 What is eutectic point? Explain characteristic of it.

Q.5 What is martensitic transformation?

Q.6 Write down the advantages of heat treatment process.

Q.7 What is solid solution?

Q.8 Explain the thermosetting and thermoplastic polymer.

Q.9 Define composite materials and its applications.

Q.10 What are Nano materials?

PART – B

Q.1 Explain with neat sketches the various types of crystal imperfections.

Q.2 What is APF? Calculate the same for HCP and FCC unit cell.

Q.3 Draw an equilibrium diagram of binary system with limited solid solubility in solid state.

Q.4 Draw a neat sketch of the TTT diagram for a eutectoid steel and label the regions.

Q.5 Explain Rockwell hardness testing method. Write its advantages and limitations.

Q.6 Discuss the properties and applications of PMMA polymers.

Q.7 Discuss the properties and applications of Al_2O_3, Si_3N_4, SiC and PSZ.

PART – C

Q.1 Draw neat labeled Iron-Carbon equilibrium diagram. Explain invariant reactions occur in this diagram.

Q.2 (a) What is recovery, recrystallization and grain growth? Draw suitable graph to explain.

(b) Distinguish between homogeneous and heterogeneous nucleation for solidification of a pure metal.

Q.3 (a) Write a short notes on urea and phenol formaldehyde.

(b) Explain the effects of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel.

Q.4 Explain tensile test, specifying standard specimen which is used for test also states the properties which can find from using this test. Also draw true and engineering stress-strain curve for Mild Steel.

Q.5 Explain various properties and application of Nano structured and Nano clusters materials.
