



# MARRI LAXMAN REDDY

## INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi &amp; Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade &amp; Recognized Under Section 2(f) &amp; 12(B) of the UGC act, 1956

### II B.Tech I Sem Regular End Examination, March 2021

## MATERIAL SCIENCE AND METALLURGY

### (MECHANICAL)

**Time: 3 Hours.****Max. Marks: 70**

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

- |   |    |   |    |    |    |
|---|----|---|----|----|----|
| 1 | a) | Sketch the crystallographic planes having the following Miller indices: (100), (110), and (111).  | 7M | CO | BL |
|   | b) | Define the following terms: (i) slip plane, (ii) slip direction, (iii) slip system (iv) grain (v) grain boundary.   | 7M | CO | BL |
| 2 | a) | Define the terms dislocation and Burgers vector. Draw sketches for edge dislocation. Explain.   | 7M | CO | BL |
|   | b) | Explain briefly about point defects.  | 7M | CO | BL |
| 3 | a) | Explain the factors governing the formation of substitutional solid solutions.  | 7M | CO | BL |
|   | b) | Draw a binary phase diagram for Cu-Ni and explain the solidification of 40% Ni alloy.   | 7M | CO | BL |
| 4 | a) | Explain various stages in Heat Treatment cycle.   | 7M | CO | BL |
|   | b) | Differentiate between annealing and normalizing.  | 7M | CO | BL |
| 5 | a) | What is an invariant reaction? List the three reactions present in the same equilibrium diagram of an alloy.  | 7M | CO | BL |
|   | b) | Using Fe-C diagram, Explain the microstructural changes of 0.2wt% C Steel.  | 7M | CO | BL |
| 6 | a) | Explain why: (i) Carburising heat treatment is generally on low carbon steels? (ii) Alloying elements in general increase hardenability of steels and (iii) Metals undergoing cyclic loading are case hardened. | 7M | CO | BL |
|   | b) | Differentiate between Austempering and Martempering.  | 7M | CO | BL |
| 7 | a) | What is the purpose of case hardening? Classify the methods of case hardening and describe briefly any two of them.   | 7M | CO | BL |
|   | b) | Mention composition, properties and uses of (i) Brass and (ii) Muntz metal.   | 7M | CO | BL |
| 8 | a) | Explain the microstructure, composition, properties and applications of Grey cast Iron.   | 7M | CO | BL |
|   | b) | Explain the Properties and applications of maraging steels.   | 7M | CO | BL |