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B. E. (Third Semester) Examination, 2020

(Old Scheme)

(Mech. Engg. Branch)

MATERIAL SCIENCE

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) of each question is compulsory. Attempt any* **two** *parts from (b), (c) and (d).*

Unit-I

1. (a) Explain the term "Unit Cell". 2

(b) State and explain Bragg's law of X-ray diffraction. 7

(c) Explain metal ingot structure in detail. 7

(d) Explain the effect of grain size on the properties of material. 7

Unit-II

2. (a) State difference between "Elastic and Plastic deformation." 2

(b) Explain edge dislocation and screw dislocation. How they are determined with burger vector? 7

(c) Expain the Critical Resolved Shear Stress (CRSS) for slip. 7

(d) Explain "hardness" and "brittleness" in brief. 7

Unit-III

3. (a) What is Laser rule? 2

(b) Explain Hume Rothery's rules in detail. 7

(c) Describe the salient feature of Iron-Carbon (Fe-C) equilibrium diagram with the help of neat sketch. Explain the importance reaction in it. 7

(d) Draw a neat diagram to show the allotropy of Iron. Explain the curve. 7

Unit-IV

4. (a) What is the purpose of heat treatment? 2

(b) Draw and explain the TTT diagram with varying carbon content. 7

(c) Write short notes on : (any **two**) 7

(i) Carburizing

(ii) Nitriding

(iii) Cyaniding

(iv) Flame hardening

(d) Explain the mechanism of martensitic transformation (in steel). 7

Unit-V

5. (a) What are the different types of cast iron? 2

(b) Write short notes on : 7

(i) High speed tool steel (HSS)

(ii) Sintered carbide

(c) Give the composition, properties and use of any **two** : 7

(i) Duralumin

(ii) Y-alloy

(iii) Monel metal

(iv) Muntz metal

(d) What are the requirements of bearing metals? Write the composition of Babbit metal. 7