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Roll No. :

337313(37)

B. E. (Third Semester) Examination, 2021

(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) What are Miller Indices? 2
- (b) Differentiate between homogeneous and heterogeneous nucleation. 7

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- (c) Explain the mechanism of solidification of metals with neat sketches. 7
- (d) What is grain growth? Explain the effect of grain growth on the properties of metals. 7

Unit-II

2. (a) What is the difference between hardness and toughness? 2
- (b) Explain the mechanism of plastic deformation. Differentiate between slip and twinning. 7
- (c) Differentiate between cold working and hot working. What is recrystallisation? 7
- (d) Write notes on : 7
- (i) Strain hardening
 - (ii) Bauschinger Effect

Unit-III

3. (a) What is Lever rule? 2
- (b) Explain Hume Rothery's rules. 7
- (c) Explain Gibb's Phase Rule. 7

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

Unit-IV

4. (a) What is annealing? 2
- (b) Explain the Time-Temperature-Transformation (TTT) curve of steel with varying carbon content. 7
- (c) Write short notes on : 7
- (i) Tempering
 - (ii) Normalizing
- (d) What is the need of heat treatment for materials? Explain the changes in the properties of the materials due to heat treatment. 7

Unit-V

5. (a) What is Plain Carbon Steel? 2
- (b) Give the composition, properties and application of the following cast iron (any two) 7
- (i) Pig Iron
 - (ii) Gray Cast Iron

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(iii) White Cast Iron

(c) Give the composition, properties and application of the following (any two) :

7

(i) Duralumin

(ii) Hindalium

(iii) Y-alloy

(d) Give the composition, properties and application of the following (any two) :

7

(i) Monel metal

(ii) Muntz Metal

(iii) High Speed Steel