

3E1412

Roll No. : _____

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B. Tech. (Sem. III) (Main & Back) Examination, February - 2013
 3AE2 Material Science & Engineering
 (Common for AE, ME, PI, AN)

Time : 3 Hours]

[Total Marks : 80

[Min. Passing Marks : 24

Attempt any five questions, selecting one question from each unit.

All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

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

1. NIL2. NIL**UNIT - I**

- 1 (a) What are Miller indices ? How are they determined ? 4
- (b) Draw neat sketches of unit cells of simple cubic BCC and FCC crystal structures. Calculate the number of atoms in each case. 4
- (c) The density of α iron is $7.87 \times 10^3 \text{ kg/m}^3$ and its atomic weight is 55.8. If α iron crystallizes in B.C.C. space lattice, find the value of lattice constant. 8

OR

- 1 (a) Discuss crystal symmetry, co-ordination number, basis lattice and Bravais space lattice. 6
- (b) The lattice constant of a unit cell of iron is 2.87 \AA . Find the number of atoms/mm² of planes (100), (110) and (111), if iron has BCC structure. 6
- (c) Calculate Atomic Packing Factor for simple cubic structure and face centred cubic structure. 4



UNIT - II

- 2 (a) What do you mean by 'preferred orientation' ? Discuss the effect of preferred orientation upon elastic properties. 8
- (b) Distinguish between following :
 (i) Slip and twin mechanisms
 (ii) Elastic and plastic deformation
 (iii) Hot and cold working. 8

OR

- 2 (a) Explain Bauginger's effect with a sketch. What is its significance ? 8
- (b) Derive an expression for critical resolved shear stress in a material subjected to uniaxial tensile loading. 8

UNIT - III

- 3 (a) Draw a neat sketch of the TTT diagram for a eutectoid steel and label the regions. Mark the cooling rate corresponding to (i) critical cooling rate, (ii) normalising. 8
- (b) What is martensitic transformation ? Explain the characteristics of martensitic transformation. 8

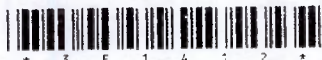
OR

- 3 (a) What do you understand by eutectic and eutectoid reactions ? Explain with the help of Fe-C diagram. 8
- (b) Explain the following conversion :
 (i) Austenite to Bainite
 (ii) Austenite to Martensite. 8

UNIT - IV

- 4 (a) Differentiate between hardness and hardenability. Draw hardness and hardenability curves for steel. 8
- (b) Explain tempering of steel and its effects. 8

OR



- 4 (a) Describe the main features of martensite transformation. 4
- (b) Distinguish between full annealing and process annealing. 6
- (c) Describe the flame hardening process and its application. 6

UNIT - V

- 5 (a) Explain the effects of various alloying elements added to carbon steels. 8
- (b) Give composition, general properties and typical application of
- (i) Red Brass
 - (ii) Duralumin
 - (iii) Monel metal
- 8

OR

- 5 (a) What are the necessary properties of a bearing alloy? Name some important bearing metals and give their approximate composition. 8
- (b) Write short notes on :
- (i) Gun Metal
 - (ii) Muntz metal
 - (iii) Bronze
 - (iv) 18-4-1 high speed steel.
- 8



