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3E1412

Roll No. : \_\_\_\_\_

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3E1412

B. Tech. (Sem. III) (Main/Back) Examination, February - 2010  
(Common for Mech., P. & I. & Automobile Engg.)  
(3AE2 Material Science and Engineering)

Time : 3 Hours]

[Total Marks : 80  
[Min. Passing Marks : 24

*Attempt overall five questions by selecting one question from each unit. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitable be assumed and stated clearly.*

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

1. \_\_\_\_\_ Nil \_\_\_\_\_ 2. \_\_\_\_\_ Nil \_\_\_\_\_

### UNIT-I

1 (a) What do you understand by the term 'crystal lattice' and how many types of this are found in metals? What is a unit cell? 10

(b) X-rays with a wave length of  $0.58 \text{ \AA}$  are used for calculating diameter of atom in nickel. The reflection angle is  $9.5^\circ$ . What is the size of unit cell? 6

OR

2 (a) What do you understand by crystallographic notation of atomic planes? Explain with the help of examples. 10

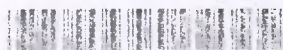
(b) Draw the following planes and directions in an FCC structure :

(i) 0 1 0

(ii) 1 1 1

(iii) 0 1 1

(iv) 0 0 1 6



## UNIT-II

- 3 (a) State difference between elastic and plastic deformation. Explain each in detail. 8
- (b) Explain difference between slipping and twinning. How does slip occur in metals? Name and explain two types of twins. 8

### OR

- 4 (a) Distinguish between the term recovery and the recrystallization involved in the process of heating cold worked metals. 6
- (b) Define Burger's vector and illustrate it on the sketch of an edge dislocation. 5
- (c) Explain the mechanism for dislocation in plastic deformation with neat sketches. 5

## UNIT-III

- 5 (a) Explain the working of TTT diagrams and what information is supplied by them? 5
- (b) Discuss the important characteristics of martensite transformation. 3
- (c) Distinguish between eutectic and eutectoid steels. 3

### OR

- 6 (a) Explain the working of iron carbon equilibrium diagrams and list the advantages and limitations of these diagrams when applied to heat treatment. 8
- (b) How do the alloying elements influence TTT curves of plain carbon steel? 8

## UNIT-IV

- 7 (a) Define the term harden ability. What factors affect harden ability? Describe a method for determining the harden ability of steel. 8



(b) What is the object of heat treatment? List the various heat treatment processes.

8

OR

8 (a) Write short notes on :

- (i) Cyaniding
- (ii) Normalizing
- (iii) Case hardening
- (iv) Annealing

8

(b) Explain different types of annealing treatments and their objects.

4

(c) What do you know about carburizing? Explain different carburizing processes.

4

#### UNIT-V

9 (a) What is an alloy steel? How are alloy steels classified? List four important alloying elements added to steel and their function.

10

(b) List properties required for a material to withstand high temperatures. Discuss the use of alloy steels as heat resisting materials.

6

OR

10 (a) What do you know about fiber reinforced plastics? Why this types of plastics are used in industries? Explain.

6

(b) Explain basic composite manufacturing methods with applications of different composite materials.

6

(c) Why is alloying done? What are the effects of chromium and nickel as alloying elements on properties of steel?

4

