

B.Tech-3rd(ME)
Engineering Materials and Metallurgy

Full Marks : 50

Time : $2\frac{1}{2}$ hours

Answer **all** questions

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2×5

- (a) Calculate the number of atoms present in an unit cell of FCC structure.
- (b) Write the uses of biomaterials.
- (c) Write the types of phases in which pure element exists.
- (d) Write down the purpose of annealing.
- (e) What is ferritic stainless steel?

(Turn Over)

(2)

2. (a) Define Polymorphism and allotropy with examples. Calculate the miller indices for a plane parallel to x-axis and z axis and intersecting y axis at -1. 4

(b) Describe with diagram the interstitial imperfection in crystal with its causes. 4

Or

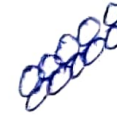
(a) Differentiate between slip and twinning methods of plastic deformation. 4

(b) Define the process of recrystallization and draw a schematic diagram of the same. 4

3. (a) Differentiate between thermosetting and thermoplastic. 4

(b) Briefly describe the ceramic materials with its properties and application. 4

(3)



Or

(a) Describe different properties of a solid material. 4

(b) Classify and describe composite materials based on the matrix material types. 4

4. (a) Define substitutional solid solution. Describe the factors that control the range of solubility in alloy system. 4

(b) Describe Gibb's phase rule. Calculate the degrees of freedom for a two-component system with number of phases one and two. 4

Or

(a) Draw the cooling curve of pure iron showing the allotropic form variations with temperature. 4

(4)

✓ (b) Define cementite and austenite structures with their properties. 4

5. (a) Describe normalizing process with its benefits. 4

(b) Describe the process of Austempering with its advantages. 4

Or

✓ (a) Write the basic purpose of hardening and characteristics of martensite transformation. 4

✓ (b) Define four methods of flame hardening. 4

6. ✓ (a) Describe the purpose of alloying. 4

✓ (b) Differentiate between nickel steel and chromium steel. 4

(5)

Or

(a) Define the effect of alloying element on carbide structure. 4

(b) Describe the properties of malleable cast iron. What is the purpose of malleabilization ? 4