

Total No. of Questions : 12]

SEAT No. :

**P4588**

[Total No. of Pages : 4

**[4957] - 112**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw the neat sketch whenever necessary.*

**SECTION - I**

- Q1)** a) Explain the recrystallization and Polygonisation. [4]
- b) Explain phenomenon of strain hardening on the basis of theory of dislocation. [4]
- c) Represent the following planes and directions in cubic system (Any Two) [4]
- i) (111)
  - ii) (101)
  - iii) (221)
- d) What is the role of dislocation in the plastic deformation of metal? [4]

OR

- Q2)** a) Differentiate between the following (Any one) [4]
- i) Slip and Twinning
  - ii) hot and cold working.
- b) Derive the equation for critical resolve shear stress during slip in a single crystal. [4]
- c) How plastic deformation in polycrystalline material is different from single crystal. [4]
- d) Why annealing is done after cold working? [4]

**P.T.O.**

- Q3)** a) What is creep curve? Explain the stages of creep [4]  
b) Define the following : [4]  
i) Toughness  
ii) Malleability  
iii) UTS  
iv) Modulus of resilience.  
c) Define fatigue. Explain the processes used to improve fatigue life. [4]  
d) Rockwell Hardness Test with reference to load, indenter and application. [4]

OR

- Q4)** a) Differentiate between Charpy and Izod impact tests. [4]  
b) Why are impact test specimens notched? What is the effect of temperature on impact strength? [4]  
c) Obtain the relationship between engineering stress, strain and true stress, strain. [4]  
d) With a neat sketch explain the procedure for Vickers hardness test. [4]
- Q5)** a) Draw neatly labeled Fe-Fe<sub>3</sub>C diagram and explain the three reactions associated with it. [6]  
b) Draw and label microstructures of Mild steel, Medium steel and hypereutectoid steel. [6]  
c) What are stainless steels? Classification of stainless steels. [6]

OR

- Q6)** a) Differentiate between Nodular and malleable cast iron and give two applications of each type. Explain the manufacturing of one of them. [6]  
b) What is critical temperature? What do you understand by A<sub>0</sub>, A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub> and A<sub>cm</sub>? [6]  
c) Classify the steels on the basis of : [6]  
i) Carbon percentages.  
ii) Degree of deoxidation.  
iii) Depth of hardening.

## SECTION - II

- Q7)** a) What are the advantages and limitations or disadvantages of nitriding over carburising? [6]  
b) What are the Products of Austenite? [6]  
c) What is Hardenability? How is it measured ? [6]

OR

- Q8)** a) What is the tempering of steels? Why are hardened steels tempered ? Explain the changes in properties that occur during tempering ? [6]  
b) Differentiate between Carburising and Nitriding. [6]  
c) What is hardenability? Explain any one method of envaluating it. Discuss the factors influencing hardenability. [6]
- Q9)** a) Explain the automization process of powder manufacturing with neat sketch. [4]  
b) What is Sintering process? Explain in detail with continuous sintering furnace, used for large scale of production. [4]  
c) List the powder production processes and explain any one of them.[4]  
d) What are the properties required for the material to be bearing material. Write note on Babbitts alloys. [4]

OR

- Q10)**a) Define brass and types of brasses. Explain any one. [4]  
b) Give composition, properties and application of the following metals[4]  
i) Gun metal  
ii) Muntz metal  
c) What are the advantages and limitations of Powder Metallurgy Process. [4]  
d) Write short note Refractory materials. [4]
- Q11)**a) Write short note on Shape Memory Alloys. [4]  
b) Write short note on : Ferrites. [4]  
c) Write short note on : Cryogenic materials. [4]  
d) Explain with suitable example Nano materials. [4]

OR

- Q12)**a) Differentiate between fibre reinforced and particle reinforced composites. [4]
- b) Write a note on dispersion strengthened composites and state the applications. [4]
- c) Explain the effects of cryogenic temperature on mechanical properties of materials. [4]
- d) Explain different types of biomaterials. [4]

