

B.E. Mechanical Engineering (Model Curriculum) Sem-III
PCC-ME205 : Material Engineering

P. Pages : 2

Time : Three Hours



GUG/W/22/14059

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Answer Q.1 or Q.2, Q.3 or Q. 4, Q. 5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
 3. Assume suitable data wherever necessary.
 4. Use graph paper for plotting phase diagrams.
 5. Due credit will be given to neatness and adequate dimensions.
 6. Illustrate your answers wherever necessary with the help of neat sketches.
 7. Diagrams & chemical equation should be given wherever necessary.

1. a) What are the different imperfections in solids? Explain any two in details. 8
- b) What do you mean by “Bravais lattice? Explain crystal structure of cubic unit cell. 8

OR

2. a) Draw a miller indices for following planes: 8
i) 111 ii) 101 iii) 001 iv) 100
- b) Explain the effect of crystal structure on properties of metal with suitable example. 8
3. a) What is ‘Hook’s law? Compare and contrast between True stress strain curve and engineering stress strain curve. 8
- b) Classify the ‘Engineering Materials’ in detail with suitable example. 8
4. a) What do you mean by ‘destructive and non-destructive testing’? Enlist different types of hardness test and explain any one in brief. 8
- b) Define ‘Red hardness’. What is ‘superalloys’? Explain the importance of high temperature alloys in power plant and nuclear application. 8
5. a) What do you mean ‘Phase diagrams’. Draw a conceptual phase diagram for following: 8
i) Isomorphous system
ii) Partial eutectic system
iii) Fully eutectic system
- b) State Gibb’s phase rule and lever rule, Justify, why pure metal solidifies at constant temperature while alloys over a range. 8

OR

6. a) Explain the ‘Solidification of pure metals and alloy’s in detail. 8
- b) What are ‘solid solution’? What are the different types of solid solution? Explain them in detail with suitable example. 8

7. a) Draw a Fe–Fe₃C equilibrium phase diagram showing critical lines, temperatures, composition and respective phases. 8
- b) What are the different invariant reactions involved in Fe–Fe₃C equilibrium phase diagram? Calculate the amount exact amount of phases present at equilibrium temperatures. 8

OR

8. a) Compare and Contrast between austempering and martempering treatment with suitable diagram. 8
- b) Compare and Contrast between annealing and normalizing heat treatment with suitable example. 8
9. a) Classify cast iron in brief. Explain their microstructures in detail. 8
- b) Give composition and application for following: 8
- i) Muntz metal ii) Admiralty brass iii) Gun metal iv) LM 13 alloy

OR

10. a) With the help of suitable heat treatment cycle, explain how malleable cast iron is produced? 8
- b) Give composition and application for following: 8
- i) Gliding metal ii) Cartridge brass iii) Phosphor bronze iv) Aluminium bronze
