



2 JUN 2009

B.E. Sem. IV Mech/Auto (Regular)

June - 2009

Material Technology

[Max. Marks : 100]

Time : 3 Hours]

- Instructions :**
- (1) Attempt all questions.
 - (2) Figures to the right indicate full marks.
 - (3) Assume suitable data, if necessary.

1. (a) Define the term system, phase, component and variables. Give the statement of Gibb's phase rule. 05
- (b) What do you understand by a solid solution ? Explain substitutional solid solution and interstitial solid solution with neat sketch. 05
- (c) What is Lever rule? Find the relative amount of ferrite and cementite in plain carbon steel containing 0.8% carbon at 723 °C. 06

OR

- (c) Draw cooling curves for pure metal, binary alloy, and binary eutectic alloy and mention important points. 06
2. (a) What is phase diagram? Draw the sketch of isomorphous and eutectic phase diagram with specific example from alloy system. 05
- (b) State the purpose of heat treatment. List out the factors to be considered while heat treatment of metals or alloys. 05
- (c) Draw iron-iron carbide equilibrium diagram and label it properly. 08

OR

- (c) Define the term : 08
(i) Pearlite (ii) Cementite (iii) Martensite (iv) Bainite
Also write the following phase transformation reactions with reference to the iron-iron carbide equilibrium diagram.
(i) Eutectic reaction (ii) Eutectoid reaction and (iii) Peritectic reaction.
3. (a) Differentiate between annealing and normalizing. 05
- (b) Draw a neat sketch of Time-Temperature-Transformation (TTT) diagram for eutectoid steel. Define critical cooling rate and show it on the TTT diagram. 05
- (c) What do you mean by hardening of steel ? Briefly discuss the factors affecting hardening process. 06

OR

- (c) Define hardenability. Briefly discuss the factors affecting the hardenability of steel. 06

4. (a) State the purpose of alloying of steel. List out the effect of alloying elements (Cr, Ni, V and Ti) on the properties of steel. **05**
- (b) Differentiate between gray and white cast irons. **05**
- (c) State the purpose of applying coating on metal surface. Explain the process of hot-dipping (galvanizing). **06**

OR

- (c) Enlist common non-destructive testing methods. Differentiate between X-ray and Gamma ray radiography.

5. (a) What is powder metallurgy ? List out the methods of powder preparation and discuss any one in detail. **05**
- (b) What are the advantages and disadvantages of powder metallurgy technique ? **06**

OR

- (b) Write short note on any **two** of the following : **06**
- (i) Self lubricating bearing
- (ii) Cemented carbide tipped tools
- (iii) Glass fiber reinforced polymer composite
- (c) What is nano technology ? Briefly mention the applications of nano technology. **05**

6. Write short note on any **four** : **18**
- (i) Thermal spray coating
- (ii) Coding of steels as per AISI or IS.
- (iii) Stainless Steel
- (iv) Tool steel
- (v) Hybrid composites
- (vi) Ultrasonic testing
- (vii) Spheroidal Graphite (SG) cast iron