

GANPAT UNIVERSITY
B. Tech. Semester: Vth Mechanical Engineering
Regular Examination Nov – Dec 2015
2ME501 Material Technology

Time: 3 Hours

Total Marks: 70

- Instructions: i) Answer two sections separately.
ii) Figures to the right indicate full marks.
iii) Assume suitable data if necessary.

Section I

- Q.1
- | | | |
|-----|--|----|
| [a] | Explain Gibbs phase rule. | 12 |
| | | 4 |
| [b] | What is cooling curve? Explain cooling curve for binary alloy forming solid solution and binary alloy forming eutectic. | 4 |
| [c] | Explain importance of lever arm principle. Find out percentage of micro constituent presents at 0.2% C, 0.4% C, 0.6% C and 1.4% C at room temperature. | 4 |

OR

- Q.1
- | | | |
|-----|---|----|
| [a] | Enlist classification of refractory materials. Also discuss selection criteria of refractories for furnaces and Cupola. | 12 |
| | | 4 |
| [b] | Enlist methods of polymer materials processing. Explain any one method in detail. | 4 |
| [c] | Explain role of matrix and reinforcement materials in composite materials. | 4 |
- Q.2
- | | | |
|-----|--|----|
| [a] | With the help of suitable diagram, show full annealing and hardening temperature ranges for plain carbon steel in case of hypo eutectoid and hypereutectoid steel respectively. What are the criteria for selection of these temperature ranges? | 12 |
| | | 5 |
| [b] | What do the microstructure of martempered and austempered steels consist of? Enlist and explain limitations of both processes. | 4 |
| [c] | Differentiate between annealing and normalizing process. | 3 |

OR

- Q.2
- | | | |
|-----|--|----|
| [a] | What is hardening process? Discuss factors affecting hardening process. | 12 |
| | | 5 |
| [b] | Explain why hardening by quenching is followed by tempering treatment? Describe the structural changes that take place during tempering. | 4 |
| [c] | Explain temper brittleness and temper colour. | 3 |

[Type text]

- Q.3 11
- [a] Explain effects of following elements on cast iron: 3
i) Silicon ii) Sulphur iii) Manganese iv) Phosphorus
- [b] Differentiate between gray and nodular cast iron with respect to microstructure, properties and applications. 4
- [c] Differentiate between white and malleable cast iron with respect to microstructure, properties and applications. 4

Section - II

- Q.4 11
- [a] Define solid solution. Explain Hume Rothery rules. 4
- [b] Draw Iron-Iron Carbide phase diagram and the label the phase fields. Discuss the different reactions that take place in the systems. 5
- [c] Define following phases: 2
i) Ferrite, ii) Austenite

OR

- Q.4 11
- [a] Enlist and explain constituents and properties of Brass and Bronze. 4
- [b] Enlist properties and applications of any two Aluminum alloy. 4
- [c] Enlist and explain classification of Composite materials. 3
- Q.5 12
- [a] Enlist advantages, disadvantages and applications of Powder Metallurgy. 4
- [b] Enlist methods of production of powder in Powder metallurgy. Explain any two methods in detail. 4
- [c] Explain compacting, presintering and sintering operation in powder Metallurgy. 4

OR

- Q.5 12
- [a] Explain procedural steps to construct T.T.T. diagram of 0.8% carbon steel 4
- [b] Draw a neat sketch of T.T.T. diagram for 0.8 % carbon steel and label the phases therein. 4
- [c] Differentiate between hardness and hardenability of steel. Explain Jominy end quench test. 4
- Q.6 12
- Write short notes on the following:(Any Three)**
- [a] Application of Nano Materials
- [b] Electrochemical corrosion
- [c] Corrosion prevention techniques
- [d] Carburizing
- [e] Flame hardening

End of Paper