

GANPAT UNIVERSITY
B.TECH. SEM- V MECHATRONICS ENGINEERING
EXAMINATION NOV/DEC-2011
MC- 502 MATERIAL TECHNOLOGY

[Time: 3 Hour]

[Total Marks: 70]

Instructions:

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

Section – I

Que:1

- (A) What is cooling curve? Explain cooling curve for binary solid solution alloy.
- (B) Explain the importance of tie line and lever arm principle with suitable examples.
- (C) Explain allotropic transformation of pure iron.

OR

Que:1

- (A) Define the following terms:
(i) Phase (ii) Solid solution (iii) Degree of freedom
- (B) Draw a neat sketch and explain following phase diagram for binary eutectic system:
(i) Two metals completely soluble in the liquid state but completely insoluble in solid state.
(ii) Two metals completely soluble in the liquid state but partially soluble in solid state.
- (C) Explain Gibbs phase rule with suitable examples.

Que:2

- (A) Draw Fe-Fe₃C equilibrium diagram with all necessary details.
- (B) Draw microstructure of 0.2, 0.8 and 1.2% carbon steel. Also find relative amounts of phase present at room temperature.
- (C) Define the following terms:
(i) Ferrite (ii) Cementite (iii) Pearlite

OR

Que:2

- (A) What is the principle of cyaniding? Differentiate between nitriding and cyaniding.
- (B) Explain the principle of carburizing. Differentiate between solid carburizing and gas carburizing.
- (C) Explain briefly induction hardening.

Que: 3

- (A) What is T.T.T. diagram? Draw a neat sketch of T.T.T. diagram for 0.8% carbon steel.
- (B) Explain the following with respect to T.T.T. diagram:
(i) Austempering (ii) Martempering (iii) Critical cooling rate.
- (C) Define following cast iron with respect to its microstructure and application:
(i) Gray cast iron and (ii) Malleable cast iron.

Section – II

Que:4

12

- (A) What are the main stages of powder metallurgy? Also give the advantages and limitation of powder metallurgy?
- (B) Explain in detail the brequetting or die compaction process.
- (C) Enumerate the main characteristics of metal powder.

OR

Que:4

12

- (A) Explain the following powder metallurgy process:
(i) Centrifugal atomization (ii) Ball milling
- (B) Discuss the design consideration require for powder metallurgy articles.
- (C) Describe the functions of pre-sintering and sintering process.

Que:5

11

- (A) Write the different techniques of corrosion control. And also discuss the design against the corrosion.
- (B) Explain the oxygen absorption mechanism with suitable example.
- (C) Differentiate the electrochemical corrosion and direct corrosion.

OR

Que:5

11

- (A) What is heattreatment? Explain process variables involved in heat treatment process.
- (B) Differentiate between annealing and normalizing process. Explain importance of isothermal annealing process.
- (C) What is tempering? Define temper color and temper brittleness.

Que: 6 Write short notes on following:(Any three)

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- (A) Define the following terms:
(i) Crystalline material(ii) Amorphous material (iii) Space lattice
- (B) Diffusion annealing
- (C) Hardening process
- (D) Induction hardening
- (E) Flame hardening

END OF PAPER