

## GUJARAT UNIVERSITY

## B.E. Sem IV (Mech./Auto.) (New) Examination

## Material Technology

Tuesday, 17th June, 2008]

[Time : 3 Hours

Max. Marks : 100

- Instructions :** (1) Attempt all questions.  
 (2) Answer to the two sections must be written in **separate** answer books.  
 (3) Figures to the right indicate **full** marks.  
 (4) Assume suitable data if necessary.

**SECTION I**

- 1 Attempt *any three* of following : 18
- (a) What is solid solution? Discuss interstitial & substitutional solid solution.
- (b) Explain the Iron-carbon equilibrium diagram with neat sketch.
- (c) Draw and explain Time-Temperature-Transformation (TTT) diagram for eutectoid steel. Also show the critical cooling curve and define critical cooling rate.
- (d) Define the heat treatment. Explain the need or purpose of heat treatment.
- 2 (a) List the various types of case hardening processes and explain the carburising. 5
- (b) Define the refractory material. Write the properties and applications of refractory materials with suitable example. 5
- (c) How steel is differing than cast iron? Classify the steels and explain the high speed tool steel. 6
- OR**
- 2 (a) Write the short note on stainless steel through its properties, types and uses. 5
- (b) Sketch the microstructure and identify in same different phases of : (i) Grey cast iron (ii) Nodular cast iron 5
- (c) Classify the refractory materials. Describe about the fire clay through composition, properties and applications 6
- 3 (a) Write the effect of following constituent element on cast iron : i) Silicon, ii) Phosphorus, iii) Sulphur, iv) Manganese v) Carbon 5
- (b) "The solubility of carbon is more in austenite than ferrite", Evaluate the statement. 5
- (c) Distinguish between hardenability and hardness. List the methods used for measuring the hardenability and explain any one. 6
- OR**
- 3 (a) Write the effect of following alloying element in alloy steels : i) Nickel, ii) Vanadium, iii) Cobalt, iv) Tungsten v) Titanium 5
- (b) Evaluate the statement, "Iron is not an allotropic metal". 5
- (c) Differentiate between ferrite and pearlite in term of lattice structure, carbon percentage, situation responsible for their formation, properties and example of their availability. 6

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### SECTION – II

- 4 Attempt *any three* of following : 18
- (a) What is powder metallurgy? Enlist the various steps involved in powder metallurgy and explain any one of them.
  - (b) List the characteristics of metal powder which are affects on the quality of resulted powder metallurgical product. Discuss the effect of any one such characteristic.
  - (c) Write the short note on chemical vapour deposition (CVD) process.
  - (d) State the purpose of applying coatings. Explain the galvanizing coating.
- 5 (a) How the non destructive testing differs from destructive testing. Give the example for each testing group with its use. 5
- (b) What is Spectroscopy? Explain with neat sketch electron microscope. 5
- (c) Write the short note on Liquid penetratant test by principle, method, types and application. 6
- OR**
- 5 (a) Describe the construction and working principle of a Transmission electron microscope (TEM). 5
- (b) Explain the principle of magnetic particle test (MPT). What the advantage of wet-MPT method over the dry-MPT method. 5
- (c) Write the principle of ultrasonic testing with its advantages and limitations 6
- 6 (a) Define the composites and classify. Why they are prefer over the other group of materials? 5
- (b) What are the factors, which governs the properties of composites? Explain through suitable example 5
- (c) Define nanotechnology and write its applications in various domains. 6
- OR**
- 6 (a) List the material from which the fibers are made. Write the applications of composite material in which the carbon fibers are used. 5
- (b) Write the advantages of nanotechnology. 5
- (c) Write the short note on metal matrix composite (MMC). 6
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