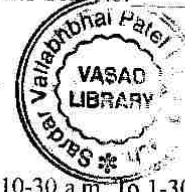


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Candidates Seat No. _____

GUJARAT UNIVERSITY
B.E. Sem. – IV (Mech/Auto) (New) Examination
Material Technology



Tuesday, 30th May, 2006]

[Time: 10-30 a.m. To 1-30 p.m.

[Max.Marks : 100

- Instruction :** (1) Attempt all questions.
(2) Answers to the sections must be written separately.
(3) Figures to right indicate marks.
(4) Assume suitable data if necessary.

SECTION - I

Que 1. A) State whether following statements are true or false, justify your answer. (Any six) 18

- 1) Austenite is obtained at room temperature in plain carbon steels.
- 2) Solubility of carbon is more in austenite than ferrite.
- 3) Martensitic stainless steels are best suited for surgical instruments.
- 4) The properties of cast iron cannot be altered by cooling rate.
- 5) Annealing of steel results in fine grain size.
- 6) Sintering is carried out in controlled atmospheric furnace.
- 7) Self-lubricating bearings can only be manufactured by powder metallurgy.
- 8) Anodic coatings are superior to cathodic coatings from the point of corrosion resistance.

- Que. 2 A) Explain with showing changes in microstructures on iron-carbon equilibrium diagram, the slow cooling of hypo eutectoid steels at 0.2 % carbon. 08
- B) Explain the steps for plotting T-T-T diagram and discuss the importance of T-T-T diagram. 06
- C) List any two limitations of iron-carbon equilibrium diagram. 02

OR

- Que. 2 A) Explain with the help of composition, properties and uses austenitic and martensitic stainless steels. 08
- B) Explain the following transformations 08
- 1) Austenite to pearlite & 2) Austenite to bainite transformation

- Que. 3. A) Compare white cast iron with Gray cast iron in terms of their composition, microstructures and applications. 06
- B) Write a short note on 'Nodular cast iron' 04
- C) Explain the effect of any four alloying elements on the properties & microstructures of cast irons. 06

OR

- Que. 3 A) Why is heat treatment of steels done? Explain with examples. 06
- B) What is spheroidising? State its purpose. 04
- C) Define hardenability. How is it measured? What affects the hardenability of steels? 06

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SECTION- II

- Que.4. A) What is powder metallurgy? Discuss the advantages and disadvantages of powder metallurgy technique over the other methods of fabrication. 06
B) What is blending of metal powders? Why is it done? 04
C) What is meant by powder characterization? Mention some of the important characteristics of powders. 06

OR

- Que. 4.
A) Explain the Chemical Vapour Deposition (CVD) process. List the advantages of CVD process over PVD process. Give the unique applications of this process. 08
B) On the basis of chemical behavior, classify refractory materials. State composition, properties and uses of fire clay. 06
C) State the purposes of applying coatings on metals. 02

- Que. 5.
A) What is a composite? What do the properties of composite materials depend upon? 03
B) Explain with suitable examples dispersion-strengthened composites. 06
C) What is fiber-reinforced composite? Explain briefly how the volume of fiber, fiber orientation, and fiber strength and modulus affect the properties of fiber-reinforced composites. 07

OR

- Que. 5
A) What do you mean by X-ray, γ - ray and xero radiography? 06
B) List the advantages, limitations and applications of ultrasonic testing. 06
C) Which method do you think to be suitable for the quality inspection of welded joints? Why? 04

- Que. 6 Write a short note on following (any three) 18
a) Nanotechnology
b) Liquid penetrant testing
c) Ceramic-matrix composites
d) Selection of refractory materials for cupola.
e) Tool Steels

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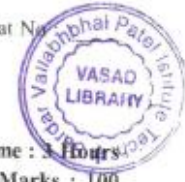
Candidate's Seat No.

GUJARAT UNIVERSITY

B. E. Sem IV (Mechanical/Auto.) Examination
Material Technology

Thursday, 31st May, 2007]

[Time : 3 Hours
Max. Marks : 100



- Instructions :** (1) Attempt all questions from each section.
(2) Answer to the two sections must be written in separate answer books.
(3) Figures to the right indicate full marks.
(4) Draw neat sketch whenever required and assume suitable data if necessary.

SECTION I

- 1 (a) At Eutectic point degrees of freedom is zero. Prove the validity of statement. (02)
(b) What is solid solution? Discuss interstitial & substitutional solid solutions. (06)
(c) What is lever rule? Calculate relative amount of austenite & cementite in cast iron containing 4.3% carbon at 1147°C. (04)
(d) Draw cooling curves for the following. (i) Pure metal (ii) Binary solid solution (iii) Binary Eutectic alloy (04)
- 2 (a) Draw & explain Time-Temperature-Transformation (TTT) diagram for eutectoid steel. Also show the critical cooling curve in TTT diagram and define the critical cooling rate. (06)
(b) Why surface hardening of steel is done? Describe the process of solid carburizing. (05)
(c) Why tempering of steel is done? Discuss the different stages of tempering. (05)
- OR
- 2 (a) Draw and label in detail iron carbon equilibrium diagram and explain peritectic and eutectic reactions with reference to it. (06)
(b) Flame hardening & Induction hardening of steel. (06)
(c) State the purpose of heat treatment. State briefly effect of grain size on properties of steel. (04)
- 3 Write short notes on any three of the following (18)
(a) Define refractory materials. State the desirable properties of refractory materials, classify refractory material & differentiate between acid & basic refractories.
(b) Briefly discuss coding of steels as per B.I.S. & AISI
(c) Stainless steels.
(d) What are requirements of tool steels? State the composition, properties & applications of H.S.S. high-speed steels.
(e) X-ray & γ -ray radiography & differentiate it.

P. T. O.

SECTION - II

- 4 (a) Define nanotechnology, give advantages, disadvantages and applications of nanotechnology. (06)
- (b) Define composite materials. List various fiber reinforced composite materials with examples & explain whiskers. (05)
- (c) Write short note on particle reinforced and dispersion strengthened composites with examples. (05)
- 5 (a) Explain with sketch construction and working principle of a Transmission Electron Microscope (TEM) and enlist specimen preparation techniques used for TEM. (06)
- (b) Differentiate between gray cast iron & spheroidal cast iron in terms of microstructure, properties, composition & applications. (06)
- (c) What is the function of inoculants used in grey cast iron? Give some examples of materials used as inoculants and explain defects observed in gray cast iron. (04)
- OR
- 5 (a) Write short note on Physical Vapor Deposition (PVD) technique. (05)
- (b) What is powder metallurgy? Enlist various steps involved in powder metallurgy components. Describe the process of compaction and sintering. (05)
- (c) Enlist different methods used in control & prevention of corrosion. Which points are to be taken care of while designing a piece of equipment for prevention of corrosion? (06)
- 6 Write short notes on any three of the following (18)
- (a) State the purpose of coatings on materials. Discuss briefly Thermal spray coatings.
- (b) Explain manufacturing of cemented carbide tools by powder metallurgy. What is the role of cobalt in this?
- (c) Define hardenability? Differentiate between hardness & hardenability of steel and discuss factors affecting hardenability in detail.
- (d) Magnetic particle inspection method.
- (e) State the purpose of alloying in steels. Briefly discuss the effect of chromium, nickel, molybdenum, silicon and manganese on the properties of steels.