

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III • EXAMINATION – SUMMER • 2014

Subject Code: 131904

Date: 04-06-2014

Subject Name: Materials Science and Metallurgy

Time: 02.30 pm - 05.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) Explain process to be followed for preparation of metallic specimen to see the microstructure under optical microscope. Name only commonly used etchant. (7)
- (b) (1) Define following properties of engineering materials. (4)
[i] Hardenability [ii] Toughness [iii] Stiffness and [iv] Ductility
(2) Draw any three most commonly observed space lattice structure in metallic elements. (3)
- Q.2 (a) (1) Define Powder metallurgy. Enlist methods of metal powder manufacturing. (3)
(2) Discuss any one metal powder manufacturing methods in detail. (4)
(b) Discuss importance of knowledge on “Material Science & metallurgy” to mechanical engineers. (7)
- OR
- (b) What is Galvanic series? Explain cathodic protection method for prevention of corrosion. (7)
- Q.3 (a) Draw iron – iron carbide equilibrium diagram. Show important phases in it. Discuss the phase transformation takes place for the 0.6 % carbon steel from liquid to room temperature. Explain Structure properties relationship of 0.6 % steel at room temperature. (10)
- (b) Draw microstructure of [i] Nodular cast iron [ii] eutectoid steel at room temperature along with magnification, etchant used and description of microstructure. (4)
- OR
- Q.3 (a) What is solid solution? What are the types? Explain them with neat sketch. Under which condition interstitial solid solution is feasible? (7)
- (b) It is require finding out hardenability of an alloy steel. Explain procedure to be followed to find out and the equipments required for the same. (7)
- Q.4 (a) It is required to find out surface defects for the cast product. Which NDT process you will use? Explain basic principle and limitations of the test you have selected (7)
- (b) Discuss advantages and limitations of Powder Metallurgy. (7)
- OR
- Q.4 (a) Classify different types of cast iron. Why silicon is added to cast iron? Explain the effects of any four alloying elements on the properties of cast iron. (7)
- (b) What is the purpose of Heat Treatment? Differentiate between Annealing and normalizing. (7)
- Q.5 (a) Enlist case hardening processes. Discuss induction hardening process along with advantages, limitations and any two applications. (7)
- (b) Define critical cooling rate of steel. Discuss the TTT diagram with complete labeling. (7)
- OR
- Q.5 (a) Enlist copper and its alloys. Explain any two of them along with its properties and use. (7)
- (b) (1) Differentiate between Austempering and Martempering. (3)
(2) Differentiate between edge dislocation and screw dislocation. (4)
