

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-III • EXAMINATION – SUMMER 2013

Subject Code: X 31902**Date: 13-05-2013****Subject Name: Material Science & 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) Define 1) Toughness 2) Hardness 3) Hardenability 07
 4) Malleability 5) Creep 6) Elasticity 7) Ductility
- (b) Discuss selection criteria for materials used in engineering applications 07
- Q.2** (a) What is solid solution? Explain types of solid solution. Also give 07
 Hume Rothery's Rules.
- (b) What is Gibb's phase rule? Define system, phase and degree of 07
 freedom. Show that the degree of freedom at eutectic point in a binary
 phase diagram is zero.
- OR**
- (b) Explain the effects on steel by alloying elements Silicon, Sulphur, 07
 Magnesium and Phosphorous.
- Q.3** (a) Draw and Explain Iron Carbon Equilibrium diagram 07
- (b) Discuss mechanisms of quenching of steel. State the advantages and 07
 drawbacks of water & oil as quenching media.
- OR**
- Q.3** (a) Define "Alloy". Also state composition, properties & uses of any two 07
 copper alloys.
- (b) Define Critical Cooling Rate of steel and show the same on a TTT 07
 diagram with complete labeling.
- Q.4** (a) Give composition, properties and uses of malleable cast iron. 07
- (b) Which are various Surface Hardening processes? Explain Induction 07
 Hardening process with sketch.
- OR**
- Q.4** (a) List the purposes of heat treatment. Differentiate between annealing & 07
 normalizing.
- (b) What is "Wrought Iron"? Enlist the properties and uses of it. 07
- Q.5** (a) Explain cathodic protection against corrosion. 07
- (b) Which are advantages and limitations of powder metallurgy? 07
- OR**
- Q.5** (a) Explain the NDT method widely used for inspection of castings. 07
- (b) Explain any two methods for production of metal powders. 07
