

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**
