Seat No.:	Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-III • EXAMINATION - WINTER • 2014

Subject Code: X 31902 Date: 29-12-2014 **Subject Name: Material Science and Metallurgy** Time: 10:30 am - 01:00 pm **Total Marks: 70 Instructions:** 1. Attempt all questions. 2. Make suitable assumptions wherever necessary. 3. Figures to the right indicate full marks. 0.1 Define (1) Toughness (2) Hardness (3) Hardenability (4) Malleability 07 (a) (6) Elasticity (7) Ductility. **(b)** What are micro and macro examination? Explain steps for micro examination 07 process. What is Gibb's phase rule? Define system, phase and degree of freedom. Show 07 **Q.2** (a) that the degree of freedom at eutectic point in a binary phase diagram is zero. What is atomic packing factor? Calculate the same for BCC and FCC structures. **(b) 07** Discuss selection criteria for materials used in engineering applications. 07 **(b) Q.3** 07 Draw and Explain Iron Carbon Equilibrium diagram. (a) **(b)** What is phase diagram? Explain Lever rule. **07** OR Explain thermal equilibrium diagrams of binary alloy completely soluble in solid **07** 0.3 (a) **(b)** Define Critical Cooling Rate of steel and show the same on a TTT diagram with **07** complete labeling.

Q.4 (a) Explain Jiminy Quench Test.

(b) Discuss mechanisms of quenching of steel. State the advantages and drawbacks of water & oil as quenching media.

OR

Q.4 (a) Define "Alloy". Also state composition, properties & uses of any two copper alloys.

(b) What are advantages and limitations of powder metallurgy?

Q.5 (a) What is Wrought iron? Enlist properties and application of it.

(b) Explain cathodic protection against corrosion.

OR

Q.5 (a) Explain the NDT method widely used for inspection of castings. 07

(b) Explain application of Annealing, Normalizing and Spheroidizing. Explain any one from above process.

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