# GUJARAT TECHNOLOGICAL UNIVERSITY
**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019**

**Subject Code: 2131904**                                                **Date: 30/11/2019**
**Subject Name: Material Science and Metallurgy**
**Time: 02:30 PM TO 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.**

|      |     |                                                                                                  | MARKS |
|------|-----|--------------------------------------------------------------------------------------------------|-------|
| Q.1  | (a) | Explain in brief Materials Science & Metallurgy.                                                 | 03    |
|      | (b) | Explain in brief important of dislocations.                                                      | 04    |
|      | (c) | Determine atomic packing factor for BCC crystal structure with sketch.                           | 07    |
|      |     |                                                                                                  |       |
| Q.2  | (a) | Explain the Twin boundaries by suitable sketches.                                                | 03    |
|      | (b) | Explain in brief "Total Energy of Nucleation".                                                   | 04    |
|      | (c) | Draw & Explain Iron-Iron Carbide Diagram with all regions.                                       | 07    |
|      |     | **OR**                                                                                           |       |
|      | (c) | Explain the Hume Rothery's Rules with different Factors.                                          | 07    |
| Q.3  | (a) | State & Explain the Gibbs Phase Rule with suitable Example.                                       | 03    |
|      | (b) | What is Solidification? Explain various defects of Solidification.                                | 04    |
|      | (c) | Explain in Detail Ultrasonic testing Method with sketch and advantages, disadvantages & applications. | 07    |
|      |     | **OR**                                                                                           |       |
| Q.3  | (a) | Write short note on annealing process.                                                           | 03    |
|      | (b) | What are the factors that decide the types of cast irons?                                        | 04    |
|      | (c) | Explain the process of specimen preparation with different steps.                                | 07    |
| Q.4  | (a) | Explain in Brief "Application of Diffusion".                                                      | 03    |
|      | (b) | Explain the Formation of Nuclei & Grain Structure.                                               | 04    |
|      | (c) | List out the difference between Austempering Process & Martempering Process.                      | 07    |
|      |     | **OR**                                                                                           |       |
| Q.4  | (a) | State critical reactions of Iron-carbon phase Diagram.                                           | 03    |
|      | (b) | Write the basic steps for powder metallurgy method.                                              | 04    |
|      | (c) | Write a Brief short notes on Bearing Steel, Spring steel & H. S. S.                               | 07    |
| Q.5  | (a) | State & Explain Lever Rule for phase diagram                                                      | 03    |
|      | (b) | Explain the construction of Metallurgical Microscope with sketch.                                | 04    |
|      | (c) | Write short notes on Nickel And Its Alloys.                                                       | 07    |
|      |     | **OR**                                                                                           |       |
| Q.5  | (a) | Write short note on Gray Cast Iron.                                                               | 03    |
|      | (b) | Explain the Induction Hardening process with diagram.                                            | 04    |
|      | (c) | Explain Radiography Testing method with neat sketch. Also explain limitations and applications   | 07    |

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