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**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**  
**End Semester Examination – SUMMER 2019**

**Course: B. Tech in Mechanical Engineering**

**Sem: III**

**Subject Name: Material Science and Metallurgy**

**Subject Code: BTMEC302**

**Max Marks: 60**

**Date: 29-05-2019**

**Duration: 3 Hr.**

**Instructions to the Students:**

1. Solve **ANY FIVE** questions out of the following.
2. The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

|   | Marks     |
|---|-----------|
| <b>Q.1 Solve Any Two of the following.</b>  | <b>12</b> |
| A) What is plastic deformation? Explain with neat sketch plastic deformation by slip.   |           |
| B) Define the term coordination number, packing density and atomic radius. And prove the packing density of the FCC unit cell is 0.74 |           |
| C) Classify crystal imperfections and explain screw dislocation in details.   |           |
| <b>Q.2 Solve Any Two of the following.</b>  | <b>12</b> |
| A) Derive relation between engineering and true stress-strain and also draw true stress-strain curve for mild steel.                  |           |
| B) Classify hardness tests. Explain Rockwell hardness test in detail.   |           |
| C) Explain with neat sketch Izod impact test. How Izod impact test is different from charpy impact test.                              |           |
| <b>Q.3 Solve Any two of the following.</b>  | <b>12</b> |
| A) Explain Iron-Iron carbide equilibrium diagram with neat sketch.  |           |
| B) With neat sketch describe the mechanism of transformation of austenite to bainite.   |           |
| C) Define the critical cooling rate of a steel and show the critical cooling rate on a TTT diagram.                                   |           |
| <b>Q.4 Solve Any Two of the following.</b>  | <b>12</b> |
| A) What is annealing? State the purpose of annealing and also plot the heating temperature band for full annealing.                   |           |
| B) Define hardenability. Explain Jominy-End quench test for hardenability with neat sketch.   |           |
| C) Classify surface hardening processes. Explain any one in detail.   |           |
| <b>Q.5 Solve Any two of the following.</b>  | <b>12</b> |
| A) Explain the procedure followed in specimen preparation in metallography.   |           |
| B) Describe spark test. What observations to be noted and also draw spark patterns for low and high carbon steels                     |           |

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