

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2024****Subject Code:3131904****Date:19-07-2024****Subject Name: Material Science and Metallurgy****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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|------------|---|-----------|
| Q.1 | (a) Give a brief classification of materials. | 03 |
| | (b) Explain the role of material science and metallurgy in advancement of civilization. | 04 |
| | (c) Explain the criteria for selection of materials for engineering applications. | 07 |
| Q.2 | (a) Explain the concept of allotropy with a relevant example. | 03 |
| | (b) Calculate atomic packing factor for SC and BCC materials. | 04 |
| | (c) Explain the mechanism of crystallization. Derive the formula to calculate critical radius of nuclei for homogeneous nucleation. | 07 |
| | OR | |
| | (c) Define crystal structure. List and draw seven crystal structures. | 07 |
| Q.3 | (a) List advantages and limitations of spark test. | 03 |
| | (b) Draw edge and screw dislocation. | 04 |
| | (c) Define system, surrounding, phase, component and degree of freedom. Write Gibb's phase rule for unary and binary system. | 07 |
| | OR | |
| Q.3 | (a) Write a short note on non equilibrium cooling. | 03 |
| | (b) Draw frenkel and schottky defect. | 04 |
| | (c) List and explain the steps in preparation of specimens for microscopic examination. | 07 |
| Q.4 | (a) Draw the microstructure of a solidified pure metal ingot. | 03 |
| | (b) Write invariant reactions of eutectic and peritectoid reaction. | 04 |
| | (c) Draw a well labeled Iron – Iron Carbide phase diagram. | 07 |
| | OR | |
| Q.4 | (a) Draw a sample cooling curve for pure metal. | 03 |
| | (b) Write invariant reactions of monotectic and eutectoid reaction. | 04 |
| | (c) Define solid solution. List the types of solid solutions. List Hume Rothery rules for solid solution formation. | 07 |
| Q.5 | (a) List methods for production of metal powder. | 03 |
| | (b) Draw a well labeled Time – Temperature – Transformation Diagram. | 04 |
| | (c) List the types of annealing process. Explain full annealing in detail. | 07 |
| | OR | |
| Q.5 | (a) Write the applications of powder metallurgy. | 03 |
| | (b) List the types of corrosion. Explain any one in brief. | 04 |
| | (c) List non destructive testing methods. Explain dye penetration testing in detail. | 07 |
