

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2024****Subject Code:3142108****Date:15-07-2024****Subject Name: Mechanical Properties of Materials****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.

MARK

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|------------|---|-----------|
| Q.1 | (a) What is importance of Mechanical Properties of Materials? | 03 |
| | (b) Explain yield point with respect to design perspective. | 04 |
| | (c) Explain stress-strain curve for (i) Ductile material (ii) Ductile material with upper and lower yield point (iii) Brittle material (iv) Polymer material | 07 |
| Q.2 | (a) Explain engineering stress-strain diagram of brittle materials | 03 |
| | (b) A relatively large plate of glass is subjected to a tensile stress of 36 MN/m ² . If the specific surface energy and modules of elasticity for this glass are 0.27 J/m ² and 70 GN/m ² respectively, determine length of a surface flow (or crack) that is possible without fracture. | 04 |
| | (c) State and explain Griffith's theory of fracture. | 07 |
| | OR | |
| | (c) Explain recrystallization, recovery and grain growth. | 07 |
| Q.3 | (a) Explain stiffness. | 03 |
| | (b) Explain resilience and toughness. | 04 |
| | (c) Distinguish cold working and hot working | 07 |
| | OR | |
| Q.3 | (a) Explain single crystal and poly-crystal materials. | 03 |
| | (b) Explain grain boundary hardening. | 04 |
| | (c) Explain solid solution strengthening. | 07 |
| Q.4 | (a) Explain point defects. | 03 |
| | (b) Explain Critical Resolved Shear Stress. | 04 |
| | (c) Differentiate slip and twinning. | 07 |
| | OR | |
| Q.4 | (a) Explain ductile to brittle transition. | 03 |
| | (b) Justify-Creep fractures are trans granular. | 04 |
| | (c) Distinguish Edge dislocation and Screw dislocation. | 07 |
| Q.5 | (a) Show the planes in cubic unit cell: (200), (10-1), (231). | 03 |
| | (b) Explain operation of Frank-Reed source. | 04 |
| | (c) Discuss with examples the ductile and brittle fracture. | 07 |
| | OR | |
| Q.5 | (a) Explain endurance limit. | 03 |
| | (b) Prove that (110) is perpendicular to (1 -1 0). | 04 |
| | (c) Differentiate elasticity and plasticity. | 07 |
