

Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering - SEMESTER - IV EXAMINATION - WINTER 2025**

**Subject Code: 3142209**

**Date: 24-11-2025**

**Subject Name: Rock Mechanics**

**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.**
- 4. Simple and non-programmable scientific calculators are allowed.**

|                                                                                                                   | <b>Marks</b> |
|-------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Q.1 (a)</b> State the application of rock mechanics in mining.                                                 | <b>03</b>    |
| <b>(b)</b> How to calculate density of rock sample? Explain with one example.                                     | <b>04</b>    |
| <b>(c)</b> Describe briefly about the different tests to determine the Permeability of rock sample.               | <b>07</b>    |
| <b>Q.2 (a)</b> Name the physico-mechanical properties of rock.                                                    | <b>03</b>    |
| <b>(b)</b> With the help of neat diagram, explain stress-strain curve.                                            | <b>04</b>    |
| <b>(c)</b> Briefly explain “Compressive strength of rock”.                                                        | <b>07</b>    |
| <b>OR</b>                                                                                                         |              |
| <b>(c)</b> What are the methods of determining of shear strength of rock? Discuss about any one method in detail. | <b>07</b>    |
| <b>Q.3 (a)</b> What is meant by hardness of rocks? Also write the mohr’s scale of hardness.                       | <b>03</b>    |
| <b>(b)</b> What is Brazilian test? Explain with one example.                                                      | <b>04</b>    |
| <b>(c)</b> Discuss rock mass rating (RMR) & Q system in detail.                                                   | <b>07</b>    |
| <b>OR</b>                                                                                                         |              |
| <b>(a)</b> Define Porosity and moisture content of rock.                                                          | <b>03</b>    |
| <b>(b)</b> Explain Rock Quality Designation Index (RQD) in detail.                                                | <b>04</b>    |
| <b>(c)</b> Explain briefly about rheology & rheological models.                                                   | <b>07</b>    |
| <b>Q.4 (a)</b> State the effect of joints and fracture on mechanical properties of rocks.                         | <b>03</b>    |
| <b>(b)</b> Discuss about the creep behaviour of rock.                                                             | <b>04</b>    |
| <b>(c)</b> Discuss the Griffith’s theory of fracture in rock mass.                                                | <b>07</b>    |
| <b>OR</b>                                                                                                         |              |
| <b>(a)</b> Define Modulus of elasticity and Poisson’s ratio.                                                      | <b>03</b>    |
| <b>(b)</b> Explain different types of failure in rock.                                                            | <b>04</b>    |

(c) What do you understand by pre-mining state of stress? Explain hydraulic fracturing method in detail. 07

**Q.5 (a)** How to do the roof testing? 03

(b) Discuss Mohr's and Coulomb theories of failure. 04

(c) Write in detail the theory of reinforcement of rock mass by rock bolting 07

**OR**

(a) Define Ideally Plastic, perfectly Plastic and Elastic Plastic materials. 03

(b) What do you understand by permeability? 04

(c) Explain dynamic properties of rock. 07

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