

PRACTICE SET
End Semester Examination, Spring- 2026

Program: B.TECH (MINING)
Semester: IV
Subject: Elements of Rock Mechanics
Subject Code: 8PCCMiE204

Course Outcome:

On the completion of the Course, the students will be able to:

Course Outcomes	Description
CO1	Understand the basic knowledge of rock mechanics for understanding, formulating and solving strata control problem in any underground mine.
CO2	Explain the various physico mechanical properties of rock in respect to mining.
CO3	Acquire knowledge and hands-on competence in applying the concepts of rock failure theories.
CO4	Evaluate the dynamic properties of rock, creep theory and rock mass by various Laboratory test & in situ test.

UNIT I

Section B (10 Marks)

1. Explain the tensile strength of rock with reference to Brazilian Test? **CO1 (Understand)**
2. Explain the Flexural strength of bending test? **CO1 (Analyse)**
3. State the definition of stress. Explain the shear stress with diagram? **CO1 (remember)**
4. Discuss the scalar, vector, and tensor in brief with suitable examples. **CO1 (Understand)**
5. What do you understand by the term “anisotropy”? Provide a brief explanation. **CO1 (understand)**
6. Discuss various strength parameters also describe about the major factors influencing strength of rock. **CO1 (analyse)**
7. Describe the significance of rock mechanics in the field of mining and tunneling? **CO1 (understand)**

Section C (20 marks)

8. A Bar of 30 mm is subjected to a Pull of 60 KN the measured extension on gauge length of 200mm is 0.1mm and change in diameter is 0.004mm , calculate the young's modulus, Poisson's ratio and bulk modulus . **HOT CO1 (Apply)**
9. A sandstone specimen of diameter 54 mm and height 60 mm has moisture content of 20 % and specific gravity 2.65. Calculate the porosity of the sandstone. **HOT CO1 (Apply)**

UNIT II

Section B (10 Marks)

10. Derive the expression for the total volumetric strain under uniform loading condition. **CO2 (Apply)**
11. Discuss the RMR (Rock Mass Rating) and its parameter which is necessary to evaluate the ratings. **CO2 (remember)**
12. Discuss about the Joint alteration number and how Rock Tunneling index which is known as Q- System is related with the J_a . **CO2 (Understand)**
13. Strata control monitoring plan which is known as SCAMP, why DGMS has introduces it in the underground mining and how it is being followed in the real mining scenario. **CO2 (Analyse)**
14. Explain the Stress Strain relationship of an elastic material or Hooke's law for one dimensional loading condition. **CO2 (Understand)**
15. Write a short note on followings: **CO2 (remember)**
 - a. Orientation
 - b. Spacing
 - c. Persistence
 - d. Roughness

Section C (20 marks)

16. A coarse and aquifer has porosity 20% and hydraulic conductivity 3.5×10^{-3} m/s. if the hydraulic gradient is 0.00423 (m/m), then calculate the average linear velocity of the groundwater in mm/s. **HOT CO2 (evaluate)**
17. A rock specimen was subjected to diametrical point load testing. The pressure gauge reading at failure is 12.5 MPa. If the ram area is 13.36 cm^2 and the diameter of the core tested is 54 mm. calculate the point load strength index of the rock specimen? **HOT CO2 (evaluate)**

UNIT III

Section B (10 Marks)

18. Describe the Mohr's coulomb failure criteria also derive an expression. **CO3 (analyse)**
19. Discuss the Hoek- Brown Criteria also explain the hoek – brown criteria in principle plane: Two dimensions. **CO3 (analyse)**
20. Discuss the Geological strength index and also formulate the Rock mass quality with reference to GSI value. **CO3 (analyse)**

Section C (20 marks)

21. The components of state of stress at a point in x-y plane are given as $\sigma_{xx} = 40 \text{ MPa}$, $\sigma_{yy} = 20 \text{ MPa}$ and $\tau_{xy} = 15 \text{ MPa}$. Calculate the major and minor principle stresses acting on the x-y plane in Mpa? **HOT CO3 (evaluate)**

22. In a sand stowing arrangement the slurry has a sand concentration of 35% by volume. The specific gravity of sand grain is 2.6. Calculate the concentration of sand by weight in the slurry in percent. **HOT CO3 (evaluate)**

UNIT IV

Section B (10 Marks)

23. Define Coal Mine Roof Rating with respect to rock mass classification system. **CO4 (analyse)**
24. Explain the body wave and surface wave. **CO4 (understand)**
25. Write a short note on the followings: **CO4 (understand)**
- a) Cohesion
 - b) Internal angle of friction
26. What do you understand by confining pressure? How confining pressure play a key role in triaxial test of rocks? **CO4 (apply)**

Section C (20 marks)

27. A Circular tunnel of radius 3m is constructed in a hydrostatic stress field of 15 MPa. The modulus of elasticity and Poisson's ratio of the rock are 5GPa and 0.25 respectively. A uniform support pressure P_i is applied to the tunnel boundary to restrict the radial deformation at the tunnel boundary to 4mm. Evaluate the value of P_i ? **HOT CO4 (evaluate)**
28. A 2.5m thick coal seam lying at an average depth of 100m has been developed by bord and pillar method. The width of the square pillar is 30m Centre to center and the gallery width is 4m. The average density of the overlying strata is 26 kN/m³ and the pillar strength is 4500 kN/m². Calculate factor of safety and extraction ratio during development of the pillar. **HOT CO4 (evaluate)**

Summary Sheet

CO Wise

CO	Q. No	Marks
CO1	1, 2, 3, 4, 5, 11, 12, 13	85
CO2	6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 41	170
CO3	25, 26, 27, 28, 29, 30, 31, 32, 33, 34	100
CO4	35, 36, 37, 38, 39, 40, 42, 43, 44, 45	90
Total		445

Unit Wise

Unit	Q. No	Marks
Unit 1	1, 2, 3, 4, 5, 11, 12, 13	85

Unit 2	6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 41	170
Unit 3	25, 26, 27, 28, 29, 30, 31, 32, 33, 34	100
Unit 4	35, 36, 37, 38, 39, 40, 42, 43, 44, 45	90
Total		445

Blooms Taxonomy Level (BTL) Wise

BTL	Q. No	Marks
LOT	1, 2, 3, 4, 5, 7, 8, 9, 11, 14, 15, 18, 19, 21, 22, 25, 27, 29, 37, 39, 40, 41, 42	195
HOT	6, 10, 12, 13, 16, 17, 20, 23, 24, 26, 28, 30, 31, 32, 33, 34, 35, 38, 43, 44, 45	250
Total		445

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Disclaimer: - This is a practice set. The Question in End term examination will differ from the practice set. This practice set is meant for practice only.