CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **18MN55**

Fifth Semester B.E. Degree Examination, July/August 2022
Rock Mechanics

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the scope and importance of Rock Mechanics in Mining Industry. **(10 Marks)**
   b. Describe the development and application of Rock Mechanics in Mining Industry. **(10 Marks)**

OR

2 a. Estimate Joint shear strength of joint using Barton – Bandis model assuming that the joint roughness coefficient = 7.1 , Joint wall compressive strength = 170.5 MPa , Residual friction angle = 28.4° and Effective normal stress = 3MPa. **(05 Marks)**
   b. List out the ten parameters used to describe discontinuities in rocks and define any five parameters. **(15 Marks)**

Module-2

3 a. What are Normal stress and Tangential stress on an incline plane? Give expression to calculate the same and define the parameters used. **(10 Marks)**
   b. When Torsional loading T is applied to bar Fig. Q3(b), it produces a state of pure shear stress in the material. Determine the principal stresses , maximum shear stresses and their planes. **(10 Marks)**

Fig. Q3(b)
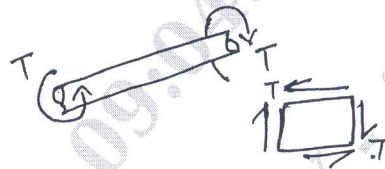
OR

4 a. At a certain point, a material is subjected to the following state of strains :
   $\epsilon_x = 400 \times 10^{-6}$; $\epsilon_y = 200 \times 10^{-6}$; $\gamma_{xy} = 35 \times 10^{-6}$.
   Determine the magnitudes of the principal strains, the direction of the principal strains axes and the strain on an axis inclined at 30° clock wise to the X – axis. **(12 Marks)**
   b. Illustrate the Elasto – Plastic behavior of Rocks. **(08 Marks)**

Module-3

5 a. Define : Porosity , Durability , Moisture content , Bulk density. **(08 Marks)**
   b. Explain the Laboratory procedure to determine durability of Rocks. **(12 Marks)**

OR

6 a. Discuss the factor responsible for Rock strength. **(04 Marks)**
   b. Explain with neat sketch, how to determine Uniaxial compressive strength of the Rock. **(10 Marks)**
   c. Explain with a neat sketch, how to determine tensile strength of Rock specimen whose t/d ratio is 0.5. **(06 Marks)**

Module-4

7 Explain with neat sketch, the following :   (10 Marks)
   a. Borehole Jack Test.   (10 Marks)
   b. Plate Jacking Test.

OR

8 a. Describe in detail necessity of In – situ tests.   (05 Marks)
   b. Describe in detail requirements of In – situ tests.   (05 Marks)
   c. Explain Plate load In – situ test to determine static deformability.   (10 Marks)

Module-5

9 a. Explain in detail, the Mohr – Coulomb failure criterion. Mention its limitations.   (14 Marks)
   b. In series of triaxial compression tests on a sandstone , the following represent the stresses at peak load conditions :

Test	σ_3 (MPa)	σ_1 (MPa)
1	1.0	9.2
2	5.0	28.0
3	9.5	48.7
4	15.0	74.0

Determine values of 'C' and 'ϕ' that best fit the data.   (06 Marks)

OR

10 a. Explain Dynamic properties of Rock and how to determine the same.   (12 Marks)
   b. Explain in brief, the Hoek – Brown failure criteria.   (08 Marks)

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