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)
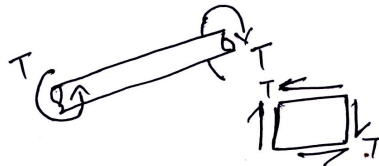
OR

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 :
   a. Borehole Jack Test. **(10 Marks)**
   b. Plate Jacking Test. **(10 Marks)**

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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