

BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
B.E. 5TH SEMESTER (MINING ENGINEERING) FINAL EXAMINATIONS, 2011
Fundamental of Rock Mechanics (MN 502)

Full Marks: 70

Time: 3 hrs

Answer six questions taking three from each half
Question No. 1 and 6 are compulsory

First Half

1. Write short notes on: Cohesion and angle of friction, Determination of weatherability of rock, Post-peak behavior in compression tests. (5 X 3 = 15)
2. Show by derivation the difference in orientation between the planes of maximum normal and shear stresses. (10)
3. Derive the expression for strains on a plane from strain measurements on rectangular a delta strain rosette. (10)
4. A series of triaxial tests were carried out on a sandstone with the following results:

Confining Stress (MPa)	Axial Stress (MPa)
2	35
4	42
6	48
8	55
10	61

Calculate the cohesion and angle of internal friction of the sandstone. (10)

5. Explain how tensile strength of rock is determined in the laboratory? How can you find out the cohesion and angle of friction of a discontinuity plane in the laboratory? (4+6)

2ND HALF

6. a) Derive the relation between cohesion and uniaxial compressive strength with angle of internal friction.
- b) A series of triaxial compression tests on intact specimens of a mudstone gave the results in the following table. Using the plot in terms of principal stresses, determine the Coulomb's shear strength that best fits the data. Assume the plot is linear.

σ_1 (MPa)	9.2	32.0	50.0	115.0	160.0
σ_3 (MPa)	1.0	4.0	10.0	12.0	15.0

(5+10)

7. Comment on the applicability of the Griffith, and Hoek-Brown criteria for the following triaxial test results on quartzite:

$(\sigma_1 + \sigma_3)/2$ (MPa)	-5.0	75	128	162	184
$(\sigma_1 - \sigma_3)/2$ (MPa)	5.0	75	112	148	166

(10)

8. a) What do you understand by fracture criteria?
- b) Deduce the relationship between shear stress and normal stress at the fracture surface using Mohr criteria. (2+8)
9. a) Write down the procedure of constructing Mohr envelope.
- b) Explain different characteristics of discontinuities. (4+6)
10. a) What precautions would you take to determine RQD?
- b) Write down the parameters for classifying rock mass according to Bieniawski.
- c) The core rock sample having a diameter of 60 mm fails at 291 KN. In a drill core run of 2.5 m, core pieces obtained are having the lengths as 345 mm, 365 mm, 105 mm, 425 mm, 97 mm, 103 mm, 75 mm, 180 mm, 25 mm, 296 mm, 64 mm, 20 mm, 210 mm and 190 mm respectively. What are the rock strength and RQD value?

(3+3+4)