

# CBCS Scheme

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15MN64

## Sixth Semester B.E. Degree Examination, June/July 2018 Rock Mechanics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Elaborate on the scope and importance of rock mechanics in mining. (08 Marks)  
b. Explain the gradual development and application of rock mechanics in the mining field. (08 Marks)

OR

- 2 Explain the following concepts with neat sketches:  
a. Hemispherical projection of discontinuities. (08 Marks)  
b. Barton's shear strength of joints. (08 Marks)

### Module-2

- 3 a. Draw a series of neat sketches to describe the construction of the Mohr's circle and strain. (10 Marks)  
b. How do you determine normal and shear stresses at any point lying on the Mohr's circle of stress? (04 Marks)  
c. What is the principle difference between the Mohr's circle of stress and strain? (02 Marks)

OR

- 4 The state of stresses on the walls of a cuboid are expressed as follows:  
i) 85 MN/m<sup>2</sup> tensile  
ii) 45 MN/m<sup>2</sup> tensile orthogonal to (i)  
iii) Shear stress of 90 MN/m<sup>2</sup>.  
a. Calculate the principal stresses with the help of a free body diagram and solve it using empirical equations. (05 Marks)  
b. Calculate principle stresses, with the help of Mohr's circle of stress and find out the planes on which they act. (06 Marks)  
c. How will the results change if (i) becomes compressions in nature. (05 Marks)

### Module-3

- 5 a. Explain the following physical properties of rock mass with necessary equations:  
i) Porosity  
ii) Moisture content  
iii) Specific gravity  
iv) Thermal conductivity. (08 Marks)  
b. With help of a neat sketch, describe the construction, principle and working of the longitudinal test to determine permeability of a rock sample. (08 Marks)

OR

- 6 a. Define and describe the principle behind the 'Point load Index' test. Describe and classify the types of tests used to determine point load index. (08 Marks)
- b. Explain and elaborate on the principle of creep with the help of a neat graph. What information is revealed by creep investigations on the rock mass. (08 Marks)

Module-4

- 7 Explain the construction and working principle along with procedure for the following in-situ tests:
- a. Plate load test (06 Marks)
- b. Cable jack test (06 Marks)
- c. Bore-hole test. (04 Marks)

OR

- 8 a. Describe in detail, the theory of Mohr Coulomb failure in the rock mass. (06 Marks)
- b. Explain Mohr's failure envelope with a neat graph. (04 Marks)
- c. Draw the Mohr's circles for the given normal stresses and determine cohesion (c) and angle of internal friction ( $\phi$ ) from the graph:

$$\sigma_{x_1} = 27\text{MPa} \quad \sigma_{y_1} = 3\text{MPa}$$

$$\sigma_{x_2} = 44\text{MPa} \quad \sigma_{y_2} = 6\text{MPa}$$

$$\sigma_{x_3} = 98\text{MPa} \quad \sigma_{y_3} = 15\text{MPa}$$

$$\sigma_{x_4} = 110\text{MPa} \quad \sigma_{y_4} = 18\text{MPa}$$

(06 Marks)

Module-5

- 9 Explain in detail with the help of a representative graph and sketch, the following rheological models.
- a. The Bingham model. (08 Marks)
- b. The Burger model. (08 Marks)

OR

- 10 Write a detailed explanation on the in-situ determination of elastic properties of the rock mass by these 2 methods:
- a. Static method (08 Marks)
- b. Dynamic method. (08 Marks)

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