Roll No.

Part-A (10 X 2 = 20 Marks)

1. How rocks are classified as per Geological classification system?

2. What are various index properties of rocks?

3. Bring out the effect of joint orientation on the strength of jointed rock.

4. What is the effect of confining stress on stress-strain characteristics of rocks?

5. What is the effect of erosion on initial horizontal stress in rocks?

6. State any two geologic features which would help in inferring directions of stresses.

7. State the modes of rock slope failure.

8. What is the effect of size of opening on stress distribution around the opening?

9. List various types of rock bolts?

10. Differentiate the concept of rock reinforcement and rock support.

Part – B (5 x 16 = 80 marks)

11. i) Discuss in detail the basis and factors considered in RMR classification system of rocks. (8)

    ii) A granitic rock is composed of a mixture of 20% quartz, 35% plagioclase, 20% augite and 25% calcite. Its porosity is 15% and its longitudinal wave velocity measured in the laboratory is 3500m/s. Describe its state of fissuring. The longitudinal wave velocities of minerals quartz, plagioclase, augite and calcite are respectively 6050m/s, 6250m/s, 7200m/s and 6600m/s. (8)

12. a(i) Discuss Mohr-Coulomb failure criterion for rocks. (8)

    a(ii) Discuss the stress-strain behaviour of rock under deviatoric loading. (8)

12. b) The following data were taken in a direct shear test conducted in the field along a rock joint, with area 0.50m². The weight of the block above the joint is 10kN.

Shear Force, kN	0	1.0	2.0	3.0	5.0	6.5	6.0	5.5	5.4	5.3
Shear Displacement, mm	0	0.5	1.0	1.5	3.0	5.2	7.5	9.5	11.5	≥12

Assuming that joint cohesion is zero, and that $\phi_\mu = \phi_{resid}$, determine the peak and residual friction angles. (16)

13. a(i) Two flat jacks, 30cm square, are placed in the wall and roof of an approximately circular test gallery 240cm in diameter. Flat jack 1 is horizontal and placed in the sidewall. Flat jack 2 is vertical, with its edge parallel to the axis of the gallery. The cancellation pressures measured were 17Mpa with Flat jack 1 and 6Mpa with Flat Jack 2. Estimate the initial stresses. (8)

a(ii) Explain over coring method to measure the initial stresses. (8)

OR

b(i) Describe the procedure to measure the initial stresses using hydraulic fracturing experiment. (8)

b(ii) Discuss the role of different geological features on initial stresses. (8)

14. a(i) Discuss in detail about the bearing capacity of shallow foundations resting on rocks. (10)

a(ii) Discuss about the stress distribution around underground openings. (6)

OR

b(i) Draw the force diagram for the analysis of plane slide condition of slope with a tension crack delimits the top of slide. (6)

b(ii) Explain in detail the kinematic analysis of rock slope stability. (10)

15. a(i) Discuss about active support and passive support. (8)

a(ii) Discuss in detail the choice of rock bolts based on rock mass conditions. (8)

OR

b(i) Discuss the installation of mechanically anchored rock bolts. (8)

b(ii) Discuss the need for rock bolting. (8)

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