B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013

CIVIL ENGINEERING BRANCH

FIFTH SEMESTER

CE9054 – Rock Engineering

(Regulation 2008)

Time: 3 Hours   Answer ALL Questions   Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are different types of rocks based on their formation?

2. A sand stone core composed of quartz and feldspar grains with calcite cement is 82mm in diameter and 169mm long. On saturation in water, its wet weight is 21.42N; after over drying its weight is 20.31N. Specific gravity is 2.7. Calculate its porosity.

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

4. List various laboratory tests for testing rock specimens.

5. A rock mass at a depth of 4000m had a value of K equal to 0.75. If Poisson's ratio is 0.3, what should K become after erosion of 1500m of rock?

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

7. State the modes of rock slope failure.

8. Draw the stress distribution around circular opening.

9. What are different causes of excavation in rocks?

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 various classification systems of rocks. (8)
    ii) List various index properties of rocks stating their importance. Explain in detail 1.Point load strength   2. Sonic velocity. (8)

12. a(i) Discuss Hoek & Brown empirical criterion of failure for rocks. (8)

    a(ii) Discuss the stress-strain behaviour of rock under hydrostatic compression. (8)

    OR

    b)   The initial state of stress at a point in the ground, in sand stone is σ_3= 9Mpa; σ_1=35Mpa. The pore water pressure will be raised by the construction of a reservoir. i) What value of pore water pressure will cause fracture of the sandstone insitu. (Assume fracture occurs at peak stress). The strength parameters for the sand stone are: S_i=1.17Mpa & ϕ=40°). ii) For this rock what is the value of the principal stress ratio above which "failure" cannot occur. (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) Describe the procedure to measure the initial stresses using hydraulic fracturing experiment. (8)

OR

b(i) Explain over coring method to measure the initial stresses. (8)

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

14. a) A rock mass to be excavated in an open cut has the following recurrent discontinuities: Set1 Strikes N32°E, dipping 75° to N58°W. Set2 Strikes NS and dips 65°E Using a kinematic analysis find the maximum slope angle for the cut oriented N40°E. Assume ϕ_i=35°. (16)

OR

b(i) Discuss about the stress distribution around underground openings. (6)

b(ii) Discuss in detail about the bearing capacity of shallow foundations resting on rocks. (10)

15. a(i) Discuss the need for rock bolting. (6)

a(ii) Discuss in detail the choice of rock bolts based on rock mass conditions. (10)

OR

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

b(ii) Discuss about active support and passive support. (8)

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