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B.E/B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV /DEC 2013

CIVIL ENGINEERING BRANCH

SIXTH SEMESTER

CE9054 – Rock Engineering
(Regulation 2008)

Time: 03 Hours

Answer ALL Questions

Max. Marks: 100

Part-A (10 X 2 = 20 Marks)

1. Water are different types of rocks based on geological classification?
2. Slake durability test was conducted on a rock specimen as per the procedure proposed by Franklin and Chandra (1972). The weight of rock retained in the drum after the test was 480g. Comment on the durability of the rock specimen.
3. Bring out the effect of joint orientation on the strength of jointed rock.
4. What is the effect of normal deformation on the strength of jointed rock mass?
5. What is the effect of erosion on the horizontal stress?
6. List any four field tests for the measurement of initial stresses in rock mass.
7. Differentiate the modes of failure of rock slopes from soil slopes.
8. Draw the stress distribution around circular opening.
9. What are different causes of excavation in rocks?
10. In what way rock reinforcement is different from rock support.

Part – B (5 x 16 = 80 marks)

11. i) Draw the force diagram for the analysis of plane slide condition of slope with a tension crack delimits the top of slide. (6)
ii) Discuss in detail about the bearing capacity of shallow foundations resting on rocks. (10)
12. a(i) Discuss in detail the Q-system of classification of rocks. (8)
a(ii) A moist rock mass is characterized by the following parameters: Joint water pressure is 5 L/min; the point load index = 10; the joint spacing = 0.6m; RQD=60%; the joint condition is characterized as slightly rough surface with aperture less than 1mm and made of soft wall rock. It is proposed to transfer the load to the rock mass. The orientation of the joint for the proposed work is favorable. Rate the rock mass based of geomechanics classification system. (8)

OR

12. b(i) Discuss in detail various index properties of rocks stating their importance. (10)
b(ii) A granitic rock is composed of a mixture of 30% quartz, 20% plagioclase, 30% augite and 20% calcite. Its porosity is 25% and its longitudinal wave velocity measured in the laboratory is 4000m/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. (6)

13. a(i) Discuss in detail about strength of anisotropic rocks. (8)
a(ii) Discuss the behavior of rock under Hydrostatic compression. (8)

OR

- b(i) $S_j=0$ and $\phi_j=28^\circ$ for a sawed joint oriented 50° from vertical in a saturated triaxial compression specimen. The confining pressure is 2MPa and the axial stress $\sigma_1=5\text{Mpa}$ with zero joint water pressure. What water pressure will cause the joint to slip if σ_1 and σ_3 are held constant. (8)
b(ii) Discuss the Hoek and Brown failure criterion. (8)

14. a(i) Stress measurements in a horizontal rock outcrop using a series of vertical flat jacks all give a cancellation pressure of about 80Mpa. The rock is granite with $E=5 \times 10^4 \text{Mpa}$ and $\mu = 0.25$. If the rock started its life at a depth of 10 km with $\sigma_v = \sigma_h$ and was brought to the surface by erosion. What should be the value of the horizontal stress? ($\gamma=27 \text{ kN/m}^3$). (8)
a(ii) Describe the procedure to measure the initial stresses using hydraulic fracturing experiment. (8)

OR

- b(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 20Mpa with Flat jack 1 and 8Mpa with Flat Jack 2. Estimate the initial stresses. (8)
b(ii) Discuss the role of different geological features on initial stresses. (8)

15. a(i) Discuss about active support and passive support. (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 the need for rock bolting. (8)
