U.S.N | | | | | | | | | | |

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech - Civil Engineering (MCAD)

Semester End Examination; Jan/Feb - 2016

Stability Analysis of Slopes and Earth Retaining Structures

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.*
ii) IS code and charts are permitted.
iii) Missing data, if any, assume suitably.

UNIT - I

1 a. With the help of neat sketch explain Rankine's earth pressure theory for C - ϕ soil. 10

b. An 8 m high retaining wall supports a 5.5 m deep sand having γ_d = 18.5 kN/m^3 and ϕ = 34º overlaying a saturated sandy clay with γ_{sat} = 20.3 kN/m^3, ϕ = 28º and C = 17 kPa. The ground water level is located at the interface of two layers. Sketch the lateral stress distribution up to a depth of 8 m for an active condition. 10

2 a. With neat sketch explain cantilever sheet piling in granular soils. 10

b. A masonry retaining wall of trapezoidal section has its top width equal to 0.75 m and height 5 m. Its face which is in contact with the retained earth is vertical. The earth retained is level at top. The soil weighs 16 kN/m^3 and its angle of internal friction is 30º. The masonry weighs 24 kN/m^3. Determine the minimum width of the base to avoid tensile stressed and determine the maximum compressive stresses for this base width. If the coefficient of friction between base and the soil is 0.60. Check the stability of retaining wall against sliding. 10

UNIT - II

3 a. What are the causes of slope failure? Explain them with neat sketch. 8

b. An infinitely long slope having an inclination of 26º in an area is underlain by firm cohesive soil (G = 2.72 and e = 0.50). There is a thin, weak layer of soil 6 m below and parallel to the slope surface (C = 25 kN/m^2 and ϕ = 16º). Compute the factor of safety when the slope is dry. If ground water flow could occur parallel to the slope on the ground surface, What factor of safety would result? 12

4 a. Describe the effect of seepage on slope stability under different condition. 10

b. With the help of neat sketch explain types of slope failure and their sequence. 10

UNIT - III

5 a. Explain the stability analysis of infinite slopes with respect to cohesive soils. 10

b. With neat sketches explain friction circle method. 10

Contd…..2

6. An embankment has a slope of 2 horizontal to 1 vertical with a height of 10 m. It is made of soil having cohesion of 30 kN/m^2, an angle of internal friction of 5º and a unit weight of 20 kN/m^3. Consider any slip circle passing through the toe. Use the friction circle method to find the factor of safety with respect to cohesion. 20

UNIT - IV

7 a. Explain the basic mechanism of reinforced earth. 10

b. With the help of sketches explain different applications of soil reinforcement. 10

8. Explain step by step procedure of designing reinforced earth retaining wall. 20

UNIT - V

9. A building consists of 12 columns 400 mm x 400 mm sizes arranged in three rows of four each. The distance between the columns is 5.0 m each. The load carried by four corner column is 500 kN each and that carried by interior column is 900 kN each. The allowable soil pressure is 50 kN/m^2. Design the raft foundation. 20

10. Design an annular raft for an overhead tank of capacity 200 kL having staging height of 22.0 m. The depth of raft below ground surfaces is 2.5 m. The tank is situated in seismic zone III. The earthquake force results a moment of 8670 kN.m at the base of footing. The soil is cohesionless and the allowable soil pressure works out as 85 kN/m^2 limiting total settlement to 50 mm. 20

* * *