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

(An Autonomous Institution affiliated to VTU, Belgaum)

Sixth Semester, B.E. – Civil Engineering

Semester End Examination; June - 2016

Geotechnical Engineering - II

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Missing data may suitably be assumed.

UNIT - I

1 a. Describe the primary objectives of soil exploration. 6

b. Write a brief note on geophysical exploration of soil using electrical resistivity method. 8

c. Distinguish between undisturbed and disturbed soil sample. 6

2 a. What is meant by drainage and dewatering technique? Explain the purpose of drainage and dewatering. 6

b. Explain with neat sketches of single stage well points and multistage well points. 8

c. Explain briefly Electro-Osmosis method of drainage of cohesive soils. 6

UNIT - II

3 a. Distinguish between Boussinesq and Westergaard equations for stresses in soil. 6

b. Explain the construction of Newmark's influence chart and how it is used. 6

c. A concentrated point load of 200 kN acts at the ground surface. Find the intensity of Vertical pressure at a depth of 10 m below the ground surface and situated on the axis of loading. What will be the vertical pressure at a distance of 2 m from the axis of loading? Using Boussinnesq's equation for the analysis. 8

4 a. What are the assumptions of Laplace equation? 6

b. Define flow nets. Explain the utilization of flow nets for various purposes. 8

c. For a homogeneous earth dam 32 m high and 2 m free board, a flow net was constructed with four flow channels. The number of potential drops was 20, the dam has a horizontal filter at the base near the toe, the coefficient of permeability of the soil was 9×10^{-2} mm/sec. Determine the anticipated seepage, if the 3 length of the dam is 100 m. 6

UNIT - III

5 a. Define earth pressure. Explain the variation of earth pressure with movement of retaining wall. 6

b. Explain the graphical method of estimating active earth pressure by Culman's construction. 6

c. A retaining wall of 7.5 m high retains a cohesionless backfill. The top 3 m of the fill has a unit weight 18 kN/m^3 and angle of shearing resistance 30^o and remaining has the unit weight of 24 kN/m^3 and $\phi = 20^o$. Determine the point of application of the thrust above the base of retaining of application and draw the pressure distribution diagram. 8

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6 a. Explain with neat sketches : 6

(i) Active earth pressure (ii) Passive earth pressure (iii) Earth pressure at rest

b. Explain Rankine theory of earth pressure. For what type of retaining wall and soil may this theory be used? 4

c. The retaining structure of 8 m height carries a uniform surcharge load of 16 kN/m^2. The backfill of soil mass having the following properties, G = 2.62, ϕ = 30º and e = 0.80, the water level rises upto 5 m from the base of the retaining wall. Construct the earth pressure diagram for the active case, also find the total unit thrust per unit length of the retaining wall. 10

UNIT - IV

7 a. What are the different types of failure of finite slopes? Under what conditions such failures are expected? 4

b. Explain briefly the friction circle method for determining the factor of safety of finite slope. 6

c. A canal having 8 m deep with side slope 1:1, the shear parameters at the soil are 15 kN/m^2 and 20º respectively. The elastic void ratio and grain specific gravity are 0.80 and 2.64.Determine the F.O.S. with respect to cohesion when canal funs full, what will be the F.O.S. when canal is sudden draw down condition? 10

8 a. What is Taylor's stability number? Explain its significance. 6

b. Obtain the expression for the factor of safety against failure for the C- ϕ soil by ordinary method of slices. 8

c. An embankment of 10 m height is constructed for soil having C = 20 kN/m^2, ϕ = 20º and γ = 16 kN/m^3. Find the F.O.S. with respect to cohesion and also the critical height of the embankment. Take Taylor's stability number = 0.05. 6

UNIT - V

9 a. Define ultimate and safe bearing capacity of soil. 4

b. What are the assumptions made in Terzaghi's analysis of bearing for bearing capacity of continuous footing? 6

c. A square footing 1.5 m x 1.5 m is located at a depth of 1 m, the soil has the following properties are γ = 17.5 kN/m^3, C = 20 kN/m^2 and ϕ = 20º. Using Haussen's method, compute the ultimate bearing capacity of soil, the footing base and the ground are horizontal. 10

N_c = 14.88, N_q = 6.4 and N_r = 2.9.

10 a. Explain briefly the different types of settlement. 6

b. Discuss the factors affecting settlement. 6

c. A rectangular footing 2 m x 3 m carries a column load 600 kN at a depth of 1 m. The footing rests on C - ϕ soil strata 6 m thick having the poisons ratio 0.25 and Young's modulus of elasticity as 20000 kN/m^2. Calculate the immediate elastic settlement of the footing. 8

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