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

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Civil Engineering

Semester End Examination; June - 2017

Geotechnical Engineering - II

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. List the requirements of an ideal sampler. 6

b. Distinguish between disturbed and undisturbed samples. 6

c. Explain the principles and procedure of electrical resistivity method of subsurface exploration. 8

2 a. Explain the methods of dewatering by the following approaches :
i) Vacuum Dewatering ii) Electro Osmosis. 10

b. Establish the location of ground water in a clayey stratum using Hvorslev approach. Water in the bore hole was bailed out to a depth of 10.5 m below ground surface, and the rise of water was recorded at 24 hour internal as follows : h_1 = 0.63 m , h_2 = 0.57 m and h_3 = 0.51 m. 10

UNIT - II

3 a. List the assumptions in Westergaard's theory of stress distribution in soils. 4

b. A water tank carrying a total load of 10000 kN rests on a circular raft foundation of radius 2.5 m. Assuming the foundation to be at ground surface. Find the vertical stress at a depth of 4 m at the centre of water tank. 6

c. Three columns in a row, A, B and C, 3 m apart carry loads of 400 kN, 500 kN and 600 kN respectively and are resting on isolated footings. Assuming them to apply point loads at ground surface, find the vertical stress at 4 m depth below the ground under each column. 10

4 a. List the characteristics of flownets. 4

b. Explain the method of determination of quantity of seepage from flownets. 6

c. A soil stratum 18 m thick with K = 5×10^{-9} m/s overlies an impermeable layer. A sheet pile wall penetrates 8 m into the stratum. Water stands to heights of 9 m and 1.5 m respectively above the soil stratum on upstream and downstream sides. Sketch the flownet and determine the quantity of seepage, seepage pressure and pore water pressure at the base of sheet pile and 4 m away on upstream. Also calculate maximum exit gradient. 10

UNIT - III

5 a. Distinguish between active and passive earth pressure. 8

b. A 10 m high retaining wall supports a granular backfill of unit weight 20 kN/m^3. In order to increase the height of the wall without disturbing the total active thrust, top 5 m of backfill is removed and cinder of same friction angle and unit weight of 10 kN/m^3 is replaced. Find the total height of the wall with this combination. 12

Contd….2

6 a. Explain the method of determining active earth pressure on retaining wall holding cohesive soil. What is the maximum height upto which cohesive soil can stand by itself? 10

b. Compute active earth pressure exerted on a 6 m high vertical retaining wall by Culmann's graphical method. Take angle of internal friction = 30º. Unit weight of soil = 18 kN/m^3, wall friction angle = 10º and ground inclination = 15º. 10

UNIT - IV

7 a. Obtain the expression for the factor of safety of an infinite slope against failure made up of c-ϕ soil. 8

b. A man made slope of 10 m height has an angle of 30º. It is made up of cohesive soil with unit cohesion of 30 kN/m^2 and unit weight of 16 kN/m^3. Find the critical factor of safety using Swedish circle method. Use fellineous method to find critical slip circle passing through toe of slope. If a structure at the top of slope is idealized as vertical load 600 kN/m, 2m away from the edge, find the change in factor of safety. Use graphical approach. 12

8 a. List the causes for slope failure. Explain with neat sketches, the methods to stabilize slopes. 10

b. Explain the principles and method of obtaining the stability of slopes from friction circle method. 10

UNIT - V

9 a. Explain the effects of shape of footing and eccentric load on bearing capacity of soil. 8

b. It is proposed to construct a 2 m x 3 m rectangular footing with a minimum eccentric of 50 mm in both directions in a soil having unit weight of 15 kN/m^2, unit cohesion of 10 kN/m^2 and friction angle of 26º at a depth of 1.6 m. The ground water table is 1 m below ground level of safety of 3. The bearing capacity factors for general shear failure are given below. 12

ϕ in deg	N_c	N_q	N_r
15	10.97	3.90	1.20
20	14.83	6.40	2.90
25	20.71	10.70	5.80
30	30.13	18.40	15.10

10 a. The following are the results of plate load test at the foundation level on a 300 mm x 300 mm plate. Assess the safe bearing capacity of soil. 12

Load (kN)	1	2	3	4	5	6	7	8	9	10
Settlement (mm)	2	4	6	8	10.5	14.5	20	28.5	80	125

b. A water tank of radius 3 m is proposed to carry water to a height of 5 m. Taking the self, weight of tank as 20% of weight of water, estimate the immediate settlement when soil modulus is 20 MPa, Poisson's ratio is 0.3 and influence factor is 0.9. 8

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