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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; May/June - 2018

Applied Geotechnical Engineering

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

1a. What is sub surface exploration? What are the objectives of soil exploration programme? 6

b. Briefly explain undisturbed, disturbed and representative soil samples. 6

c. Describe the seismic refraction method of geophysical method of subsurface exploration. 8

2a. Describe drainage and dewatering techniques. 6

b. How do you determine ground water level by Hvovslev's method? 8

c. Explain briefly the vacuum method dewatering technique for silty soil. 6

UNIT - II

3 a. What are the basic assumptions in Boussinesq's theory of stress distribution in soils? 4

b. Explain the contact pressure briefly. Draw the contact pressure distribution diagrams for flexible and rigid footings on sandy clayey soil. 6

c. A water tank is supported by a ring foundation having outer diameter of 10 m and inner diameter 7.5 m. The ring foundation transmits uniform loading intensity of 200 kN/m^2. Compute the vertical stress induced at a depth 4 m below the centre of ring foundation. Using, 10

i) Boussinesq's analysis ii) Westergaard's analysis. Take $\mu = 0$.

4 a. What is seepage? Describe the determination of quantity of seepage for isotropic soil. 6

b. List out and explain the properties of filters. 6

c. A concrete gravity dam 150 m long, 90 m wide lies on a permeable soil with a coefficient of permeability of $3x10^{-3}$ mm/s. The head of water is maintained at 30 m U/S and zero on D/S. The soil is underlain by an impervious stratum, the depth from base of the dam to impervious stratum is 40 m. A flow net constructed for this condition yielded seven flow channels and sixteen equipotential drops. What is the seepage loss per day? 8

UNIT - III

5 a. Explain in brief active earth pressure, passive earth pressure and earth pressure at rest condition. 6

b. Explain the graphical method of estimating active earth pressure of cohesion less soil by Rebhann's construction. 6

c. A retaining wall 4 m height supports a backfill have the following properties:

C = 200 kN/m^2, $\phi = 30^o$ and $\gamma = 20$ kN/m^3 with horizontal top flush with the top of the wall. The backfill carries a surcharge of 20 kN/m^2. If the wall is pushed towards the backfill, compute the total passive pressure on the wall and its point of application. 8

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6 a. What are the assumptions of Rankine's active earth pressure theory? 4

b. Derive an expression for Bell's equation. 6

c. A retaining wall 8 m height supports a sandy backfill having e = 0.6, G = 2.65 and $\phi = 30^o$. Ground water table is 2 m below the ground surface. Draw the active pressure diagram and determine the magnitude and point of application of total active earth pressure. Assume soil above ground water as a degree of saturation 50%. 10

UNIT - IV

7 a. Distinguish between natural slope and manmade slope. 4

b. Explain the method of slices for stability analysis of slope. 6

c. A tempary cutting 8 m deep is to be made in clay having a unit weight of 18 kN/m^3 and an average cohesion of 20 kN/m^3. A hard stratum of rock exists at a depth of 12 m below the ground surface. Using Taylor's stability curves to estimate if a 30º slope is safe. If a F.O.S of 1.25 is considered necessary, find the safe slope angle. Take $S_n = 0.163$. 10

8 a. Explain under what conditions the following types of failures are expected? 6

i) Base failure ii) Toe failure

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

c. A 5.5 m deep canal with a side slopes of 1:1 is made in a soil strata having C_u = 20 kN/m^2, $\phi_u = 12^o$ and e = 0.8 and G = 2.64. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when the canal water is full up to the top of the bank. Also determine the F.O.S for the case of sudden draw down, if the Taylor's stability number for this condition is 0.139. 8

UNIT - V

9 a. Mention the typical characteristics of local shear failure. 4

b. Describe the effect of water table on bearing capacity. 6

c. Determine the allowable grass load and net allowable load for square footing of 2 m wide and 1 m deep. The soil at the site has unit weight 18 kN/m^3 and shear parameters are 15 kN/m^2 and 25º respectively. Use Terzaghi's analysis and assume local shear failure. Take F.O.S = 3. 10

Take $N_c' = 14.8$, $N_q' = 5.6$, $N_r' = 3.2$.

10 a. Briefly explain the concept of immediate, consolidation and secondary consolidation settlements. 6

b. What are the factors affecting settlement of footings. 6

c. A soft normally consolidated clay layer is 6 m thick with water content of 35%. The clay has a saturated unit weight of 18 kN/m^3, specific gravity is 2.67 and a liquid limit of 37%, the ground water level is at the surface of clay. Determine the settlement of the foundation, if the foundation load will subject to the centre of clay layer to a vertical stress increases of 10 kN/m^2. 8

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