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320612 (20)

BE (6th Semester)

Examination, April-May 2021

Branch : Civil

GEOTECH ENGINEERING - II

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) of each unit is compulsory, whereas attempt any two parts from (b), (c) and (d). Part (a), is carrying of 2 marks and part (b), (c) and (d) are carrying of equal 7 marks in each unit. Use of stability chart is allowed.

UNIT-I

Q. 1. (a) Calculate the factor of safety in an infinite slope at a point 5 m below the surface. The slope angle with the horizontal is 20°, and the effective shear parameters for the given soil : C = 10 kN/m^2 and ϕ = 30°; unit weight of the moist soil = 19 kN/m^3. **2**

(b) Explain Sweedish Circle method of stability analysis. **7**

(c) A 8m deep cutting has side slopes of $1\frac{1}{2}$H : 1V. The soil was tested and found to have the following properties : C = 24.5 kN/m^2, e = 0.80, ϕ = 14°. Determine the factor of safety with respect to cohesion, against failure of the slope, when (i) water level in the

cut rises upto full height (ii) when water level goes down suddenly. Given : G = 2.7; and for B = 34°, Stability Numbers (N) are : 7

ϕ	N
6°	0.122
7°	0.116
14°	0.074

(d) Explain stability analysis of infinite and finite slopes. 7

UNIT-II

Q. 2. (a) Explain backfill with surcharge. 2

(b) (i) Compute the active earth pressure at a depth of 4.5 m in a sand whose

angle of friction is 37°, and density of 1.56 gm/cc in dry state.

(ii) Compute the active earth pressure also if the water-table is located at a depth of 1.5 m below the ground surface. Assume submerged density of soil as 0.985 gm/cc. **7**

(c) Explain the theories of earth pressure due to Rankine and Coulomb and indicate the fundamental assumption in each theory. **7**

(d) A 12 m high retaining wall with a smooth vertical back retains a mass of moist cohesionless sand with a horizontal surface. The sand weights 14 kN/m^3 and has an angle of internal friction equal to 32°. **7**

(i) Compute the total lateral earth pressure at rest, and its location.

(ii) If subsequently the water table rises to the ground surface, determine the increase in earth pressure at rest. Assume a suitable value of $k_R = 0.5$.

UNIT-III

Q. 3. (a) Write down the load-settlement curves for soils with diagram. **2**

(b) A foundation in a loose sand is 4 m wide, 6 m log and 1.5 m deep. The soil weights 16 kN/m^3 and has an angle of internal friction 32°. Compute the Safe Bearing Capacity, adopting a factor of safety of 2. **7**

(c) Explain with neat sketches the general shear failure below a strip footing having (i) smooth base (ii) rough base. 7

(d) Explain in brief the SPT method for determining safe bearing capacity of soils. 7

UNIT-IV

Q. 4. (a) Under what situations a well foundation is preferred over a pile foundation ? 2

(b) In a 16 pile group, the pile diameter is 0.4 m, and center to center spacing of piles in the square group is 1.5 m. If Cu = 50 kN/m^2, determine whether the failure would occur as a block failure or when the piles act individually. Neglect bearing at the tip of the pile. All piles are 12 m long.

Take $\alpha = 0.7$ for shear mobilisation around each pile. Also determine the safe load on this group. 7

(c) Describe the methods for determining load carrying capacity of piles in : 7

(i) Clay soils

(ii) Sands soils

(d) Explain shapes and components parts of well foundation with sketches. 7

UNIT-V

Q. 5. (a) What are the characteristics of CNS soils ? 2

(b) Prove that : 7

$$f_n = \frac{w_n}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

(c) The foundation for a gas engine with a vertical cylinder and vertically oscillating parts has the following data :

Total weight of Engine = 50 kN

Speed of Rotation = 300 rpm

Weight of block = 250 kN

Weight of participating soil = 200 kN

Spring stiffness = 60×10^4 kN/m

Determine the natural frequency and maximum amplitude. Take D, the value of dumping factor $\frac{c}{c_c} = 0.1$. The unbalanced vertical force is 12 kN. 7

(d) What are the problems associated with contaminated and expansive soils. 7