

6E6032

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B. Tech. (Sem. VI) (Main & Back) Examination, April-May 2018
Civil Engineering
6CE2A Geotechnical Engineering - II

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) What do you understand by Isobar ? Show the isobar for two load intensities and explain the application of the same.

8

(b) A water tower is constructed on a circular raft 5m in diameter at a depth of 2m below ground level in sand having bulk unit weight of 20 kN/m^3 . The gross intensity of pressure at the base of the raft is 140 kN/m^2 . What will be the increase in vertical stress due to raft at a point 4m beneath the centre of the raft ?

8

OR

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[P.T.O.

- 1 (a) State the assumptions to be required for the validity of Boussinesq's equation for stress distribution. Write a brief critical note on the concept of pressure bulb and its use in soil engineering practice. 8
- (b) A rectangular area $4\text{m} \times 6\text{m}$ carries a uniformly distributed load 100 kN/m^2 at the ground surface. Estimate the vertical pressure at a depth of 6m vertically below the centre and also below a corner of the loaded area. Solve the problem by dividing the loaded area in four equal parts and treating the load from each as a point load. 8

UNIT - II

- 2 (a) How many days would be required by a clay stratum 5m thick, draining at both ends with coefficient of consolidation $(C_v) = 50 \times 10^{-4} \text{ cm}^2/\text{sec.}$ to attain 50% of its ultimate settlement ? Given : $T_{50} = 0.197$. 8
- (b) Write the significance of preconsolidation pressure in soil. How would you determine the preconsolidation pressure using casagrande method ? 8

OR

- 2 (a) Explain the difference between coefficient of compressibility and the compression index. Why is the compressibility of over-consolidated clay less than that of the same clay in a normally consolidated state ? 8
- (b) Under a certain loading, a layer of clay is expected to undergo full settlement of 18 cm . Also it is expected to settle by 5 cm in the period of first 2 months of loading. Find the time required for the clay layer to settle by 10 cm . 8

UNIT - III

- 3 (a) Explain the stability analysis of earth dam. Write three critical conditions for stability analysis. 8
- (b) A slope is to be constructed at an angle of 30° with horizontal. Determine the safe height of the slope at a factor of safety of 1.5. Properties of soil are : $C = 15 \text{ kN/m}^2$, $\phi = 20^\circ$, $\gamma = 19 \text{ kN/m}^3$. Take stability number as 0.045. 8

OR

- 3 (a) What are different types of slope failures ? Derive an expression for the factor of safety of an infinite slope in a cohesionless soil. 8
- (b) Describe Frictional Circle method of stability of slopes. 8

UNIT - IV

- 4 (a) State the assumptions made in Rankine's earth pressure theory. Derive the expression for active and passive earth pressure for cohesionless soil from Rankine's theory. 8
- (b) A retaining wall has a vertical back and is 8m high, with horizontal backfill. Determine active and passive earth pressure on wall per unit length. Take $C = 100 \text{ kN/m}^2$, $\phi = 0^\circ$, $\gamma = 19 \text{ kN/m}^3$. $K_a = 0.3$, $K_p = 2.7$ 8

OR

- 4 (a) What is meant by 'earth pressure at rest, active earth pressure and passive earth pressure ? Explain with figure. 8
- (b) What are the sheet piles and their applications. Explain the analysis to determine depth of embadement of cantilever pile supporting cohesionless backfill. 8

UNIT - V

- 5 (a) Using Terzaghi theory find the ultimate bearing capacity for a square footing of $2\text{m} \times 2\text{m}$ placed at depth of 1.2 m below the ground on a pure cohesive soil having density 18 kN/m^3 . $N_c = 5.7$. Use $C = 40\text{ kN/m}^2$. 8
- (b) What are the assumptions of Terzaghi's theory of bearing capacity? Discuss its limitations. 8

OR

- 5 (a) Determine net safe bearing capacity of a footing of size $2\text{m} \times 3\text{m}$ resting at a depth of 1.5 m on a soil having $C = 0$, $\phi = 35^\circ$, $\gamma = 18\text{ kN/m}^3$. Take $N_c = 25$, $N_q = 13$ and $N_r = 11$. 8
- (b) Explain Skempton's analysis of determination of bearing capacity in saturated clay. 8