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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

[P.T.O.

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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 4m × 6m carries a uniformly distributed load 100 kN/m² 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.

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UNIT - II

2 (a) How many days would be required by a clay stratum 5m thick, draining at both ends with coefficient of consolidation $(C_v) = 50 \times 10^{-4}$ cm²/sec. to attain 50% of its ultimate settlement ? Given : $T_{50} = 0.197$.

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(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 ?

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(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.

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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 kN/m², ϕ = 20°, γ = 19 kN/m³. 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 cohessionless soil from Rankine's theory.

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(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 kN/m², ϕ = 0°, γ = 19 kN/m³.

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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 cohessionless backfill.

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UNIT - V

5 (a) Using Terzaghi theory find the ultimate bearing capacity for a square footing of 2m × 2m placed at depth of 1.2 m below the ground on a pure cohesive soil having density 18 kN/m³. N_c = 5.7. Use C = 40 kN/m².

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(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 2m × 3m resting at a depth of 1.5 m on a soil having C = 0, ϕ = 35°, γ = 18 kN/m³. 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.

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