Reg. No. : | | | | | | | | | | | | |

Question Paper Code: 1034454

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV / DEC 2024
Fourth Semester
Civil Engineering
U20CE401 – GEOTECHNICAL ENGINEERING - I
(Regulation 2020)

Time: Three Hours | Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Define the term void ratio.
2. Differentiate between consolidation and compaction.
3. List the factors affecting permeability.
4. What is a flow net?
5. What are the assumptions made in the Boussinesq equations?
6. List the components of settlement.
7. What are the advantages of direct shear test?
8. Write a short note on a tri-axial shear test?
9. What are the causes for slope failure?
10. List out the methods of analysis for the stability of finite slope?

PART – B (5 x 16 = 80 Marks)

11. (a) A soil specimen with a volume of 0.6×10^{-4} m^3 weighs 0.105 kg. Its dry weighs is 0.0802 kg and G = 2.65 Compute: (a) Water content (b) Void ratio (C) Porosity (d) degree of saturation. (16)

(OR)

(b) Explain the BIS classification for a soil system. (16)

12. (a) Determine the average coefficient of permeability in the horizontal and vertical direction for a deposit consisting of three layers of thickness 2 m, 1 m and 3 m and having the coefficient of permeability of 3×10^{-2} mm/sec, 3×10^{-5} mm/sec and 4×10^{-2} mm/sec respectively. Assume the layers are isotropic. (16)

(OR)

(b) A sandy layer 10 m thick overlies an impervious stratum. The water table is in the sandy layer at a depth of 1.5 m below the ground surface. Water is pumped out from a well at the rate of 100 lps and drawdown of the water table at radial distance of 25.0 m is 3.0 m and 0.5 m respectively. Determine the coefficient of permeability. (16)

13. (a) A soil profile consist of a surface layer of clay 4 m thick and unit weight of 19.5 KN/m^3 and a sand layer 2 m thick and unit weight is 18.5 KN/m^3 overlaying an impermeable rock. The water table is at the ground surface. If the water level in a standpipe driven into the sand layer rises 2 m above ground surface. Draw the plot showing total stress, pore water stress and effective stress. Take γ_w=10 KN/m^3. Determine the increase in effective stress at the top of the rock when an artisian head in the sand is reduced by 1 m. (16)

(OR)

(b) In the laboratory test on a clay sample of thickness 25 mm drained at top only, 50 % consolidation occurred in 11 minutes. Find the time required for the corresponding clay layer in the field 3 m thick and drained at the top and bottom to undergo 70 % consolidation. Assume T_{50} = 0.197 and T_{70}=0.405. (16)

14. (a) What is shearing strength of soil along a horizontal plane at a depth of 4 m in a deposit of sand having the following properties?

Angle of internal friction, $\boldsymbol{\phi}$ = 35°

Dry unit weight, γ_d = 17 KN/m^3

Specific gravity, G = 2.7

Assume ground water table is at a depth of 2.5 m from the ground surface. Also find the change in shear strength when water table raises the ground surface. (16)

(OR)

(b) A direct shear stress was conducted on a specimen of dry sand with a normal stress of 200 KN/m^2. Failure occurred at a shear stress of 175 KN/m^2. The size of specimen tested was 75 mm x 75 mm x 30 mm (height). Determine the angle of internal friction for a normal stress of 150 KN/m^2. What shear force would be required to cause failure of the specimen? (16)

15. (a) Write in detail the Swedish slip circle method of analysis of finite slopes. (16)

(OR)

(b) Explain briefly the Slope protection measures. (16)

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