B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E.   Semester: V
Branch: Civil Engineering   Duration: 3 hrs.
Course Code: 22CV5PCGTE   Max Marks: 100
Course: Geotechnical Engineering II

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		List the assumptions and limitations made in Terzaghi's one dimensional consolidation theory	CO1	PO1	**6**
	b)		Explain the concept of mass spring analogy of Terzaghi's one dimensional consolidation	CO1	PO1	**6**
	c)		A saturated soil of 5m thick lies above an impervious stratum below a pervious stratum. It has compression index of 0.25 and coefficient of permeability of 3.2×10^{-10} m/s. Its void ratio at a stress of 147kN/m^2 is 1.9. Calculate i. The change in voids ratio due to increase of stress to 196kPa ii. Coefficient of volume compressibility iii. Coefficient of consolidation iv. Time required for 50% consolidation	CO1	PO2	**8**
			OR			
2	a)		Explain the determination of pre-consolidation pressure by Casagrande method	CO1	PO1	**6**
	b)		Distinguish between normally consolidated and over consolidated soils.	CO1	PO1	**6**
	c)		At a building site, soil consists of dense sand upto 3m depth, normally loaded clay from 3 to 6m depth and stiff impervious rock below 6m depth. The water table is at 1m below the present ground level. Density of sand is 19.5kN/m^3 above water table and 20kN/m^3 below it. The natural water content of clay was observed as 60% and grain specific gravity is 2.65. Its liquid limit was 75%. Estimate the probable settlement, if the ground level is raised by 2m thick fill of dense sand of density 19kN/m^3	CO1	PO2	**8**

			UNIT - II			
3	a)		With neat illustrations define the types of lateral earth pressures that act on retaining structures	CO1	PO1	**6**
	b)		A two layer cohesive horizontal backfill is supported by a 10m high vertical smooth wall. Determine the Rankine's active force per unit length of the wall before a tensile crack occurs in the top layer. Also, determine the line of action of the resultant in both cases. The soil layer parameters are given below	CO1	PO2	**14**

0-5m	Top layer	c_u=12kN/m^2	ϕ_u=0°	γ=17kN/m^3
5-10m	Bottom layer	c_u=35kN/m^2	ϕ_u=10°	γ=18kN/m^3

			UNIT - III			
4	a)		Explain the types of finite slope failures	CO3	PO1	**6**
	b)		Explain the causes of slope failures and few slope protection measures	CO3	PO1	**6**
	c)		A 5m deep canal has side slopes of 1:1. The properties of soil are c_u=20kN/m^2, ϕ_u=10°, e=0.8 and G=2.8. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when the canal runs full. Also find the same in case of sudden drawdown, if Taylor's stability number for this condition is 0.137.	CO3	PO2	**8**

			UNIT - IV			
5	a)		Explain seismic refraction test with a neat sketch	CO2	PO1	**6**
	b)		Explain standard penetration test with corrections applied	CO2	PO1	**6**
	c)		During a soil exploration programme, a soil sample of length 510 mm was recovered using a split spoon sampler. The penetration length of the sample was 610mm. Dimensions of the sampler is given below: Inside and outside diameter of the sample tube = 38 and 50 mm, respectively, and Inside and outside diameter of the cutting edge = 35 and 51 mm, respectively. Determine inside clearance, outside clearance, area ratio and recovery ratio along with a sketch.	CO2	PO2	**8**

			OR			
6	a)		A water tank is supported by a ring foundation having outer diameter of 10m and inner diameter of 7.5m. The ring foundation transmits uniform load intensity of 160kN/m^2. Compute the vertical stress induced at a depth of 4m below the centre of the ring foundation using Boussinesq's analysis.	CO2	PO2	**7**
	b)		Sketch and explain the contact pressure on flexible and rigid footing resting on sand and clay	CO2	PO1	**6**

		c)	A rectangular area 4mx2m carries a uniform load of 80kN/m^2 at the ground surface. Find the vertical pressures at 5m below the centre and corner of the loaded area using equivalent point load method	CO2	PO2	7
			UNIT - V			
7	a)		Explain the effect of water table on bearing capacity of shallow foundation considering different depths of footing.	CO3	PO1	8
	b)		What will be the net safe bearing pressure of sand having $\phi=36°$, $\gamma=19$kN/m^3 under i. 1.2m wide continuous footing ii. 1.2m side square footing iii. 1.2m diameter circular footing Assume the footings are placed at 1.2m below the ground surface and that the water table is at a great depth. Assume a factor of safety of 3. Use Terzaghi's theory	CO3	PO2	12

ϕ	N_c	N_q	N_γ
35	57.8	41.4	42.4
40	95.7	81.3	100.4

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