U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

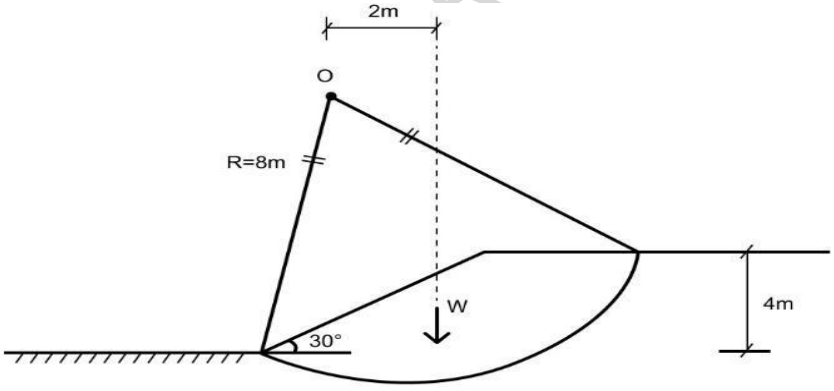
Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV5PCGTE **Max Marks: 100**
Course: Geotechnical Engineering-II

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)	Explain Terzaghi's mass spring Analogy for one dimensional consolidation of soils with neat sketch. List any two important assumptions made.	CO1	PO1	**10**
	b)	Subsurface investigation at a location revealed 6m fine sand overlying 5m thick clay The fine sand layer has water table 3m below ground surface. Above water table, unit weight of fine sand = 17kN/m^3 and submerged unit weight of fine sand = 10kN/m^3 . The clay layer has liquid limit= 42%, natural water content = 38% with G= 2.70. A building is proposed to be constructed on fine sand and the increase in pressure at the middle of clay layer due to construction is estimated to be 40kPa. Draw the given profile and Estimate the settlement of the building.	CO1	PO2	**10**
		OR			
2	a)	With a neat sketch, Explain square root t ($\sqrt{t}$) method to determine the coefficient of consolidation.	CO1	PO1	**10**
	b)	Two clay specimens A and B of thickness 2cms and 3cms respectively were subjected to consolidation test under double drainage condition. The following are the details:	CO1	PO2	**10**

	Specimen A	**Specimen B**
Equilibrium void ratio at appliedpressure of 200kpa	0.68	0.72
Equilibrium void ratio at appliedpressure of 400kpa	0.50	0.62
Time required for 40% consolidation	¼ t	t
Coefficient of permeability	k_A	k_B

Determine the ratio of coefficient of permeability of two soil specimens.

			UNIT - II			
	3	a)	Discuss different types of Lateral Earth pressure acting on retaining walls with neat sketches .	CO1	PO1	**10**
		b)	A smooth vertical wall 10m high retains a cohesion less backfill having horizontal surface with angle of shearing resistance φ = 30 degrees. The water table is located at depth of 3m from ground surface. The specific gravity of sand G= 2.65 and void ratio = 0.65. i) Draw the profile ii) Determine resultant active earth pressure and its point of action. iii) Sketch the pressure diagram.	CO1	PO2	**10**
			UNIT - III			
	4	a)	Differentiate Finite and infinite slopes. Discuss various types of finite slope failures with a neat sketch.	CO3	PO1	**10**
		b)	An embankment 4m high is inclined at a slope of 30^0 .The soil properties are c= 25kN/m^2 , γ = 20kN/m^3 and ϕ=0. The radius of a trial slip circle shown in figure below is 8m. The area of soil = 33m^2 . Sketch the slope and determine factor of safety against sliding. The distance of W from the center of slip circle =2m.  Fig Q4(b)	CO3	PO2	**10**
			UNIT - IV			
	5	a)	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	**10**

<table>
<tr><td></td><td></td><td>b)</td><td>During sub surface investigation for construction of a residential complex, SPT was conducted up to 3.5m beyond which hard strata existed. GWT was encountered at 1.5 m below ground surface. Calculate the corrected N value at all depths applying appropriate corrections as per IS 2131-1981.

<table><tr><td>Depth from GS</td><td>Bulk unit weight kN/m^3</td><td>SPT Results Depth and N Value</td></tr><tr><td>0 to 1.5m</td><td>15.0</td><td>1.5m ; 1+4+6</td></tr><tr><td>1.5m to 3.5m</td><td>18.0</td><td>3.5m; 9+15+28</td></tr></table></td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>A lighthouse is founded on circular ring type foundation having an outer diameter 16m and inner diameter 13m. The load intensity on the footing is 200kPa. Determine the vertical stress beneath the centre of footing at depth of 3m and 5m.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>A machine foundation 4m x 2m is subjected to 80kN/m^2 pressure at the ground surface. Determine the increase in vertical pressure at depth of 5m below at
i) The center of the loaded area
ii) Any one corner of the loaded area
Adopt Equivalent point load method and Tabulate the results.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Design a circular footing to carry a column load of 600 kN at a depth of 2m in a clay soil having unit weight γ=20kN/m^3 , c= 125kN/m^2 and ϕ = 0. Adopt Terzaghi's bearing capacity factors N_C=5.7, Nq= 1, Nγ = 0 and Factor of safety = 2.5.</td><td>CO3</td><td>PO2</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>A strip footing 2 m wide is founded at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5 kN/m^3 and unit weight above water table is 16.8 kN/m^3 . If c = 0 , ϕ = 35^o , Nc= 57.8, Nq= 41.4, Nγ = 42.4 , Determine the ultimate bearing capacity, with respect to shear failure when the
i) Water table is very deep
ii) Water table is at the base of the footing.
Adopt Terzaghi's analysis.</td><td>CO3</td><td>PO2</td><td>10</td></tr>
</table>

****