U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV5PCGTE **Max Marks: 100**
Course: Geotechnical Engineering - II

Instructions: Answer FIVE FULL Questions. Choice is given for unit -1 and unit -4.
Draw sketches wherever necessary. Assume any missing data suitably.
Extra Graphs sheets will be provided.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Explain in detail logarithm of time method to determine coefficient of consolidation. **10**

b) A soil profile at a location consists of fine sand 8m thick underlain by normally consolidated clay layer 5m thick. The details are shown in the table below. **10**

Fine sand	Clay	GWT from ground surface
8m	5m	4m
Above water table γ= 17kN/m^3	Liquid limit = 45% w = 40% G= 2.70	
below water table γ_{sat} =20.81 kN/m^3		

A building is proposed to be constructed on fine sand due to which the overburden pressure increases by 40 kPa. Estimate the probable consolidation settlement at the middle of the clay layer . Draw the given profile.

OR

2 a) Describe Casagrande method to determine preconsolidation pressure in soils and list any four causes of preconsolidation in soils. **10**
Explain over consolidated clay, normally consolidated clay and over consolidation ratio.

b) A 5m thick saturated soil stratum has compression index = 0.25, coefficient of permeability =3.2x10^{-3} mm/s. The void ratio was 1.90 at an applied pressure of 0.20N/mm^2. Calculate **10**
i) Void ratio when applied pressure is increased to 0.40N/mm^2.
ii) Settlement due to increase in stress.
iii) Time in minutes required for 50% consolidation under single drainage condition.

UNIT - II

3 a) A retaining wall 3.6 m high supports c=0 soil with ground surface inclined at 10 degrees to horizontal. The back of wall is inclined at 9 degrees to vertical. The backfill has γ = 16 kN/m³ and ϕ = 30 degrees. Assume angle of wall friction δ = 12 degrees. Determine Graphically by Rebhann's method the total active earth pressure. **10**

b) A retaining wall 4m high with smooth vertical back supports a cohesive backfill with horizontal surface having c = 20kN/m^2, ϕ=30 degrees, γ = 18kN/m^3. A surcharge of 15kPa acts on the top horizontal surface of the wall. If the wall is pushed towards the backfill, compute the **10**

i) Base pressure intensity p_p
ii) Total Passive pressure Pp
iii) Point of application.
iv) Sketch the pressure diagram

UNIT - III

4 a) Explain friction circle method of slope stability analysis with a neat sketch. **10**

b) Site investigation at a location revealed clay soil with c= 16 kpa, ϕ = 0 and unit weight γ = 18kN/m^3. The soil is under lain by a hard strata at a depth of 9m below the ground surface. If a cutting 6m deep is to be made in the soil, using the following table, **10**

i) Check if a slope of 30 degrees is safe or not.
ii) What will be the slope angle for a factor safety of 1.0?
iii) Comment on the results.

Slope angle i , degrees	D_f =1.0	D_f = 1.5	D_f = 2	D_f = 3
53	0.181	0.181	0.181	0.181
45	0.164	0.174	0.177	0.180
30	0.133	0.164	0.172	0.178
22.5	0.113	0.153	0.166	0.175
15	0.083	0.128	0.150	0.167
7.5	0.054	0.080	0.107	0.140

UNIT - IV

5 a) A residential complex in an area of 0.2 hectare is proposed to be constructed. You are in charge of conducting a preliminary site investigation by a rapid indirect method to assess the material lying underneath and its thickness. Which method do you adopt? **10**
Explain in detail how would you identify the soil lying underneath?

b) A machine foundation 4m x 2m carries total load of 800kN at the ground surface. Determine the increase in vertical pressure at depth of 1m below any corner of the loaded area using Equivalent point load method. Tabulate the results. **10**

OR

6 a) Assume that a unit point load acts on the ground surface, sketch and discuss its vertical pressure distribution on i) Horizontal plane ii) Vertical plane. Also explain isobars and their significance. **10**

b) During sub surface investigation for a multistoried building project a SPT was conducted up to 4.5m beyond which hard strata existed. Ground water was found at 3.5m below ground surface. Calculate the corrected N value at all depths applying appropriate corrections as per IS2131-1981 **10**

Depth from GS	Bulk unit weight kN /m^3	SPT depth	SPT results
0 to 1.5m	15	1.5m	1+2+5
1.5 to 3.5m	18	3.0m	7+13+26
3.5 to 4.5 m	19	4.5m	13+30+36

UNIT - V

7 a) A plate load test was conducted on sand using 60cm square plate and following observations were recorded. **12**

Pressure kN/m^2	0	50	100	200	300	400	500	600
Settlement, mm	0	1	2	4	7.5	12.5	20	40

i) Plot pressure versus settlement curve.
ii) Determine the failure stress and settlement.
iii) Calculate the settlement of a square footing 2m wide resting on sand.

b) 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, $\phi = 35^o$, N_c= 57.8, N_q= 41.4, N_γ = 42.4, and F= 3, determine the ultimate bearing capacity, net ultimate bearing capacity and Safe bearing capacity with respect to shear failure when water table is at the base of the footing. Adopt Terzaghi's analysis. **08**

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