Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (S, FE) Examination June 2024 (2019 Scheme)

Course Code: CET 305

Course Name: GEOTECHNICAL ENGINEERING - II

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1	Draw and explain the plot between variation of earth pressure along with movement of retaining wall.	3
2	Differentiate between Rankine's earth pressure theory with Coulomb's earth pressure theory	3
3	Explain Skempton's theory for calculating net ultimate bearing capacity.	3
4	A continuous footing of width 2.5 m rest at 1.5 m below the ground surface in clay. The unconfined compressive strength of clay 150 kN/m^2. Calculate the ultimate bearing capacity of footing. Assume unit weight of soil as 16 kN/m^3.	3
5	List out any 3 causes of differential settlement.	3
6	What are combined footings? What are the circumstances under which combined footings are provided?	3
7	Draw the load settlement curve for loading and unloading obtained from IS plate load test	3
8	A pile is driven in a uniform clay of large depth. The clay has an unconfined compression strength of 90 kN/m^2. The pile is 35 cm diameter and 8 m long. Determine the safe frictional resistance of the pile, assuming a factor of safety of 2.5. Assume the adhesion factor of 0.8.	3
9	Describe the stages involved in subsurface exploration	3
10	List out any 3 limitations of electrical resistivity method	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Explain any 4 uses of foundations	4

b) Determine the Rankine's passive force per unit length of the wall retaining 2 layers of soil, each of 2m height. The top layer of soil has a unit weight of 16 kN/m^3, angle of internal friction of 30° and cohesion of 0 kN/m^2. The bottom layer has a saturated unit weight of 19 kN/m^3, angle of internal friction of 24° and cohesion of 10 kN/m^2. Assume the water table at a depth of 2 m below the ground surface. Take unit weight of water as 10 kN/m^3. Also find the point of application of the calculated lateral thrust. 10

12 a) What is lateral earth pressure? Explain the different types of lateral earth pressure with practical examples. 7

b) A counter wall of 10 m height retains a non-cohesive backfill. The voids ratio and angle of internal friction are 0.7 and 30° respectively in loose state and they are 0.4 and 40° respectively in dense state. Calculate the active earth pressure in both cases. Also determine the percentage reduction in the active earth pressure when the soil condition changes from loose state to dense state. 7

Module -2

13 a) List out the assumptions of Terzaghi's bearing capacity theory. 7

b) Explain Terzaghi's theory for calculation of ultimate bearing capacity of soil. 7

14 a) What is the modification given to Terzaghi's bearing capacity equation for strip footing when the footing provided is circular? Determine the depth provided for a footing of 1.5 m diameter carrying a safe load of 800 kN in cohesionless soil with a factor of safety of 2.5. The soil has an angle of shearing resistance of 36° and an effective unit weight of 12 kN/m^3. Take $N_q = 49.38$ and $N_\gamma = 54$ and assume general shear failure. 7

b) A foundation 2 m x 2 m is installed at 1.2m below the surface of a uniform sandy gravel having a density of 19.2 kN/m^3 above water level and a submerged density of 10.1 kN/m^3. Take cohesion as 0, Nc, Nq and N_γ as 37.2, 22.5 and 19.7 respectively. Find the gross ultimate bearing capacity for the following cases: 7

i) Water table is well below base of foundation

ii) Water table rises to level of base of foundation

iii) Water table rises to ground level.

Also determine the percentage reduction in the gross ultimate bearing capacity when water table rises from the level of base of foundation to the ground level.

Module -3

15	a)	Explain plate load test in terms of its procedure and uses.	8
	b)	Explain the limitations of plate load test	6
16	a)	Design a rectangular combined footing for 2 columns size 0.3 m x 0.3 m and 0.4 m x 0.4 m with a centre to centre spacing of 5 m. Allow a projection of 1m on both the sides. The loads on smaller column is 600 kN and that on bigger column is 900 kN. Take allowable soil pressure as 100 kN/m^2.	8
	b)	Explain any 6 causes of settlement.	6

Module -4

17	a)	Explain using a neat diagram the elements of a well foundation	8
	b)	Explain any 6 uses of piles.	6
18	a)	Explain the classification of piles based on its mode of transfer of load.	6
	b)	A group of 9 piles with 3 piles in a row was driven into a soft clay extending from ground level to a great depth. The diameter and length of piles were 30 cm and 10 m respectively. The UCC strength of clay is 70kPa. If the piles were spaced 90 cm centre to centre. Compute the allowable load on the pile group on the basis of shear failure criterion for FOS of 2.5. Take adhesion facto as 1.	8

Module -5

19	a)	What are chunk samples? How can it be obtained?	4
	b)	Explain any 3 types of samplers using neat sketches. Name the type of sampler used for standard penetration test.	10
20	a)	Explain standard penetration test in terms of its procedure and corrections.	7
	b)	Determine the corrected N value if a SPT test is conducted on a sand deposit of 12 m depth having a unit weight of 17 kN/m^2. Assume the water table is at a height of 5 m from the base of the sand deposit. Take submerged unit weight of sand as 19 kN/m^2. The N value obtained from the test is 34.	7

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