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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R,S) (FT/WP) (S7 PT) Examination November 2025 (2019 Scheme)

Course Code: CET305

Course Name: GEOTECHNICAL ENGINEERING - II

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

		Marks
1	Mention the assumptions made in Rankine's earth pressure theory.	3
2	Demonstrate the types of lateral earth pressure.	3
3	Explain i Ultimate bearing capacity ii Safe bearing capacity	3
4	Explain Skempton's formula.	3
5	Explain estimation of immediate settlement.	3
6	Under what situations raft foundation is preferred.	3
7	Explain with neat sketches the various elements of a well foundation.	3
8	Explain negative skin friction.	3
9	Explain the I.S guidelines for choosing spacing of borings.	3
10	Point out any 6 information that can be collected during reconnaissance.	3

PART B

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

Module -1

11	a)	Illustrate different types of shallow foundations.	6
	b)	A retaining wall 6 m high retains a cohesionless soil with an angle of internal friction 30°. The surface is level with the top of wall. The unit weight of top 3m of fill is 24 kN/m^3. From 3m to 6m, the material is a cohesive soil with c= 20kN/m^2, Φ = 20°. Unit weight of cohesive soil is 18 kN/m^3. A uniform surcharge of 100kN/m^2 acts on the top of soil. Find the magnitude and application of the resultant active thrust.	8
12	a)	A retaining wall with soft saturated clay backfill is 7m high. For the undrained	7

condition (Φ =0) of the backfill, determine

i) Maximum depth of tensile crack

ii) Active force before the tensile crack occurs

iii) Active force after the occurrence of tensile crack.

γ = 16kN/m^3, c= 17kN/m^2.

b) Determine the active stress at the top and bottom of a vertical cut, 4.5m deep in soil with angle of internal friction as 16^0, cohesion of 19.1 kN/m^2 and Unit weight as 18.5 kN/m^3. What could be the depth of the potential crack? Find out the maximum depth of excavation that can be left unsupported. 7

Module -2

13 a) Determine the ultimate bearing capacity of a strip footing 1.2 m wide and having the depth of foundation of 1m. The water table reaches at the ground surface during rainy season. (Saturated unit weight = 19 kN/m^3, c= 15 kN/m^2, Nc = 57.8, Nq = 41.4, N$_\gamma$ = 42.4). 7

b) Explain 7

i) Local shear failure

ii) General shear failure

iii)Punching shear failure

14 a) A square footing 2 m wide is founded at a depth of 1.4 m in sand. Soil properties are c=0, ϕ= 35°, γ_{sat} = 19 kN/m^3 and unit weight above water table = 17.5 kN/m^3.Bearing capacity factors are N$_q$= 41.4 and N$_\gamma$ = 42.4. Determine Ultimate bearing capacity if water table is at 7

i 3.5 m below ground level

ii 1.4 m below ground level

b) Determine the allowable gross load and the net allowable load for a square footing of 2m side and with a depth of foundation of 1.0 m. Use Terzaghi's theory and assume local shear failure. Take factor of safety of 3.0. The soil at site has unit weight 0f 18 kN/m^3, c= 15kN/m^2 and angle of internal friction as 25^0. N$_c$ = 14.8, N$_q$ = 5.6, N$_\gamma$ = 3.2. 7

Module -3

15 a) Predict the causes of settlement and differential settlement. 7

b) Design the plan dimensions of a trapezoidal footing to support two adjacent 7

columns at a centre to centre distance of 5m carrying loads of 1500 kN and 3000 kN (exterior). The column size is 500 mmx500 mm. Permissible soil pressure is 300 kPa.

16 a) Design a rectangular combined footing to support two adjacent columns (size 40 cm x 40 cm). The centre lines of the columns are placed on footing at a distance of 5m between them. The boundary is 0.5 m away from the centre line of column A. The column A and B carry load of 3 MN and 4 MN respectively. The allowable soil pressure is 400 kN/m^2. 7

b) A trapezoidal footing is to be produced to support two square columns of 30 cm and 50 cm sides respectively. Columns are 6m apart and safe bearing capacity of the soil is 400 kN/m^2. The bigger column carries 5000 kN and smaller 3000 kN. Design a suitable size of the footing so that it does not extend beyond the face of the columns. 7

Module -4

17 a) A group of 9 piles 10 m long is used as a foundation for a bridge pier. The piles used are 30 cm diameter with c/c spacing 0.9 m. The subsoil consists of clay with q_u = 150 kN/m^2. Determine the efficiency neglecting end bearing action. Given adhesion factor as 0.9. 7

b) Draw a neat sketch of IS pile load test setup. Explain the determination of safe load of pile from Load-settlement plot. 7

18 a) Outline construction details of well foundation. 7

b) A square pile group of 16 piles penetrates through a filled up soil of 3 m depth. The pile diameter is 250 mm and pile c/c spacing is 0.75 m. The unit cohesion of material is 18 kN/m^2 and unit weight of soil is 15 kN/m^3. Compute the negative skin friction on the group. Assume adhesion factor =1. 7

Module -5

19 a) Demonstrate auger boring and wash boring. 7

b) Explain I.S guidelines for choosing depth of borings. 7

20 a) Discuss about Standard Penetration Test and its corrections. 7

b) Describe geophysical methods of exploration. 7

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