Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S7 (PT) (R,S) / S5 (WP) (R) Examination November 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	State any three differences between Coulomb's and Rankine's earth pressure theories.	3
2	What are the functions of a foundation?	3
3	What are the assumptions in Terzaghi's bearing capacity theory	3
4	A square footing of width 2.00 m is constructed at 1.20 m below the ground level in a homogeneous dry sand ($\gamma = 18$ kN/m^3 , $\varphi = 30°$). Determine the ultimate bearing capacity of footing against shear failure. $N_c = 65$, $N_q = 50$, $N_\gamma = 5$	3
5	What are the different types of settlement which can occur in a foundation?	3
6	What is a floating raft foundation?	3
7	Explain the classification of pile foundations based on installation.	3
8	Briefly explain the problems encountered in well sinking.	3
9	What are the main objectives of site investigation?	3
10	Write IS guidelines for disposition of boreholes for For lightly loaded residential building and For building(s) in a site covering an area of about 0.4 hectares	3

PART B

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

Module -1

11 a) A retaining wall with smooth backfill supports two layered sandy stratum to a   10
depth of 6 m. The properties of two layers are

Top layer: angle of internal friction $= 30°$, unit weight $= 18$ kN/m^3

Bottom layer angle of internal friction $= 35°$, unit weight $= 19$ kN/m^3

The top layer is 3 m thick. Draw the pressure diagram for lateral earth pressure. Calculate the magnitude and line of action of resultant of active lateral thrust on the wall using rankine's theory.

b) Explain Graphic Solution for Coulomb's Active Earth Pressure for cohesion less soil with neat figures. No need to write the equations or derivations.   4

12 a) A vertical excavation was made in a clay deposit having unit weight of 22 kN/m^3. It caved in after the depth of digging just crossed 4m. Taking the angle of internal friction $\varphi = 12°$, Calculate the value of cohesion. If the same clay is retained with a retaining wall of 8m high, Calculate i) total active thrust ii) total passive thrust. Assume that the wall yeilds far enough to allow Rankine's deformation and no tension cracks forms.   8

b) What is a shallow foundation? Sketch any four types of shallow foundations.   6

Module -2

13 a) A circular footing of diameter 1.6 m, located at a depth of 1.2 m in a cohesionless soil layer with an average unit weight of 20 kN/m^3 and angle of internal friction of 20°. The corresponding bearing capacity factors are given below Nc = 18, Nq=7, Nγ = 5. The FoS is given as 3. Find the net safe bearing capacity when i) Water table is at a depth of 5 m from ground level .   9
ii) What will be the percentage reduction in the net safe bearing capacity value if the water table rises to the ground surface? Assume the submerged unit weight as 10 kN/m^3.

b) Explain any five factors affecting the bearing capacity.   5

14 a) A strip footing is to be constructed on deep deposit of sand having an angle of internal friction of 32° and cohesion intercept 5 kN/m^2 at depth of 1m below ground level. The ground water table is at depth of 1m below ground level. Dry unit weight of sand is 16 kN/m^3 and saturated unit weight is 20 kN/m^3. The loading on the foundation is 220 kN/m length.The factor of safety is 2. Bearing capacity factors are Nc = 35, Nq=23, Nγ = 30. Assume the unit weight of water as 10 kN/m^3. Determine the width of footing using Terzhaghi's theory   8

b) What type of shear failure can be expected for footings at shallow depth, if the subsoil consists of dense homogeneous coarse-grained soil? Draw the typical pressure verses settlement curve for general and local shear failures.   6

Module -3

15 a) Design a combined footing for two columns with loads 3000kN & 5000kN.The centre to centre distance between two columns is 4.0 m. Column are having sizes 0.6 m x 0.6 m. There is a restriction of projection of footing on both column side   10

by 0.2 m from the face of the columns. Take allowable soil pressure as 200 kN/m².

b) What remedial measures can be taken to control the differential settlement of foundations?   4

16 a) Explain what are the different types of raft foundations with neat sketches? Under what circumstances raft foundations are preferred?   7

b) A footing 4m × 2m in plan, transmits a load of 1200kN on a cohesive soil having $E = 6 \times 10^4$ kN/m² and $\mu = 0.50$. Determine the immediate settlement of the footing at the centre, assuming it to be (a) a flexible footing and (b) a rigid footing   7

Module -4

17 a) A precast concrete pile of size 45 x 45cm is driven into stiff clay.The unconfined compressive strength of clay is 200kN/m².Determine the length of pile required to carry a safe working load of 400kN with a F.S 2.5.Take adhesion factor as 0.55.   7

b) Suggest any 3 methods for rectification of tilts of well foundations. Draw neat sketches to illustrate the same.   7

18 a) A square pile group of 25 piles extends between depth 2m and 12m in a deposit of 20m thick stiff clay overlying rock.The piles are 0.5m in diameter and are spaced at 1m centre to centre in the group.The undrained shear strength of the clay at the pile base level is 180kPa and average undrained shear strength over the depth of pile 110kPa.The adhesion coefficient is 0.45.Estimate the capacity of the pile group considering an overall F.S = 3.   10

b) What is negative skin friction?What is its effect on the pile?   4

Module -5

19 a) Explain in detail the procedure for standard penetration test. What are the corrections to be applied to N-value?   10

b) An SPT was conducted in a dense sand deposit at a depth of 22m and a value of 48 was observed for N. The density of sand is 15 kN/m³.What is the value of N corrected for overburden pressure?   4

20 a) Explain different types of soil samplers to collect soil samples from the ground.   8

b) Describe various salient features of a soil investigation report   6

***