Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech degree examinations (S), September 2020

Course Code: CE364

Course Name: ADVANCED FOUNDATION ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

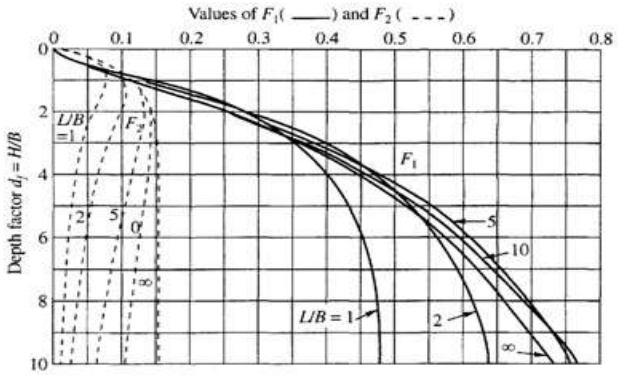
Answer any two full questions, each carries 15 marks. Marks

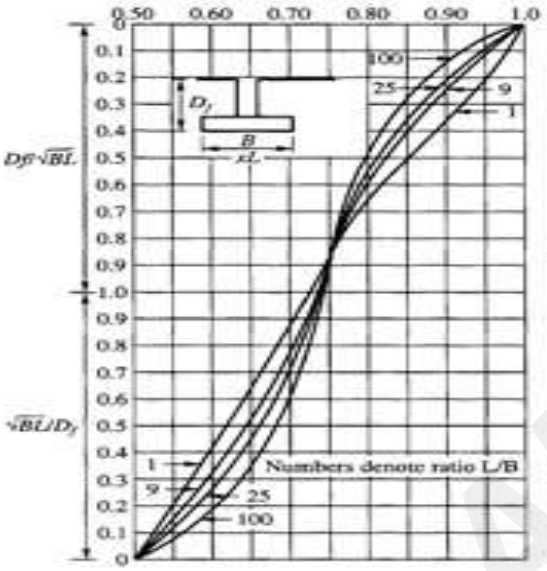
1 a) Briefly describe the general requirements of foundations. (5)

b) A rectangular footing of dimensions 2.5 m X 3 m in plan is founded at a depth of 1.5 m below the ground level. The load on the footing acts at an angle of 15^o to the vertical and is eccentric in the direction of the width by 10 cm. The saturated unit weight of soil is 18 kN/m^3. C'=15 kN/m^2, $\Phi'=30^o$. Water table is at a depth of 2m below the ground surface. Use IS 6403-1981 recommendations to calculate the net ultimate bearing capacity. For $\Phi'=30^o$, Nc=30.14, Nq= 18.4, Nγ=22.4 (10)

2 a) Briefly describe the effect of size on the settlement of footings on homogeneous sand deposits. (5)

b) A square footing of size 6m X 6 m is founded at a depth 2m below ground surface in loose sand with a net loading intensity of 100 kN/m^2. The water table is at the base of the foundation. Above the water table, γ= 16 kN/m^3 and submerged unit weight = 9 kN/m^3. Compute the elastic settlement using Steinbrenner's curve. Take μ= 0.3, depth of compressible layer is 12 m and Es=7000 kN/m^2 (10)





Correction curves for elastic settlement of flexible rectangular foundations at depth (Fox, 1948)

3 a) Compute the net safe bearing pressure of a circular footing 3 m diameter founded in a deposit of fine sand at a depth of 1.5m below ground surface. Water table occurs a depth of 3 m below ground level. The unit weight above water table is 18 kN/m3. The average N value for a depth of 6 m below the base of the footing is 18. Use Teng's correlation. The allowable settlement is 25 mm. (10)

b) Briefly discuss the methods to reduce heave during excavations. (5)

PART B

Answer any two full questions, each carries 15 marks.

4 a) A circular concrete pile of diameter 450 mm is installed in a clay stratum having undrained shear strength of 100 kPa. Determine the length of the pile needed if the pile has to carry a load of 420 kN with a factor of safety of 2.5 against shear failure. Take adhesion factor of 0.6. (7)

b) Discuss the different types of pile load tests. (8)

5 a) A concrete pile, 9m long, was driven by a single acting hammer with rated energy 40 kJ. The total settlement as recorded for the last 10 blows was 2.5 mm/ blow. Using Engineering News Record formula, calculate the pile capacity. (6)

b) A concrete square pile is 16 m long and 410 mm X 410 mm in cross-section. The pile is fully embedded in sand having unit weight of 17 kN/m^3 and angle of internal friction 30^o. Determine the ultimate load carrying capacity of the pile. Assume Nq= 90; K is one half of coefficient of passive earth pressure and δ=0.75Φ (9)

6 a) The following data was obtained in a vertical pile load test on a 400 mm diameter pile (7)

Load (kN)	50	100	200	300	400	500	600
Settlement(mm)	2.5	4	10	17	28	41	63

Plot the load-settlement curve and determine the allowable load as per IS code.

b) A 20 m deep bored pile has a shaft of 1 m diameter and enlarged base of 2 m diameter in the lower 1 m depth. The undrained cohesion of soil varies from 100 kN/m^2 at top to 250 kN/m^2 at the base. Determine the safe load (F.S = 2.5,α =0.45) (8)

PART C

Answer any two full questions, each carries 20 marks.

7 a) List the forces acting on well foundation (4)

b) A group of nine piles arranged in a square pattern is to be proportioned in a deposit of soft clay to carry an incoming load of 550 kN. Calculate the settlement of the pile group by equivalent raft approach if the piles are square with side 300 mm and have a centre to centre spacing of 500 mm. The thickness of the stratum is 8 m and the piles are embedded to a length of 5 m in the clay. The properties of the clay are given as: γ_{sat} = 19 kN/m^3, w_L= 45% and e= 1.5. Ground water table is at the ground surface. (12)

c) Explain the concept of negative skin friction (4)

8 a) A group of 16 piles of 45cm diameter is arranged with a center to center spacing of 1.0m. The piles are 8m long and are embedded in soft clay with cohesion 30kN/m^2. Adhesion factor is 0.54. Determine the ultimate load capacity of pile group. (10)

b) Explain the components of well foundations and its functions with a neat sketch. What are the different shapes of well foundations? (10)

9 a) A single tube circular well foundation of 3.5 m diameter is installed to a depth of 7m below the scour level in granular soil. The corrected standard penetration value (N value) in the bearing stratum is 60. Estimate the allowable bearing pressure of the well foundation. (5)

b) Explain Terzaghi's analysis of lateral stability of well foundation. (7)

c) Describe the methods to correct tilts and shifts during well sinking. (8)

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