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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: CE305

Course Name: GEOTECHNICAL ENGINEERING – II

Max. Marks: 100 Duration: 3 Hours

PART A

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

1 a) What are the assumptions in the Boussinesq's formula for stress distribution? (5)

b) A water tank is founded on a circular ring type foundation. The ring is of 10m external diameter and 6m internal diameter. Assuming a uniformly distributed load of 300kPa, determine the vertical pressure at a depth of 6m below the centre of the foundation. (5)

c) What is pressure bulb? Discuss its significance. (5)

2 a) Explain the use of Newmark's chart (5)

b) A wall of 8m height retains a non-cohesive backfill of dry unit weight 18kN/m^3 and φ =30°. Using Rankine's theory find the total active thrust on the wall and the point of application if it carries a uniform surcharge load of 10kPa. (10)

3 Compute the total lateral earth thrust exerted by a layered backfill of height 10m if the wall has a tendency to move towards backfill. The upper layer of thickness 6m has angle of internal friction 32° and saturated unit weight 18kN/m^3. The lower layer has angle of internal friction 28°, cohesion 20kPa, and saturated unit weight 19kN/m^3. The backfill also supports a uniform surcharge of intensity 8kN/m^2. Water table is at a depth of 5m below the surface of the backfill. Also find the point of application. Soil above water table is also saturated (15)

PART B

Answer any two full questions, each carries 15 marks.

4 a) What are the assumptions in Terzaghi's bearing capacity theory (5)

b) A square footing of 2mx2m is provided at a depth of 1m, in a sandy soil with an angle of internal friction of 30°. Compute the net safe bearing capacity of the soil with a factor of safety of 3, when the water table is at a depth of 0.5m & 1.5m below the ground level. Given G = 2.65, e = 0.7, Degree of saturation above water table = 80%, N_c=95, N_q=80.4, N_γ=100.2. (10)

5 a) Differentiate between general and local shear failure of soil. (5)

b) What remedial measures can be taken to control the differential settlement of foundations? (5)

c) Under what situations raft foundation is preferred? (5)

6 a) Explain with neat sketches, the various elements of a well foundation. (7)

b) Design the plan dimensions of a trapezoidal footing to support two adjacent columns at a centre to centre distance of 5m carrying loads of 1500kN and (8)

3000kN. The smaller column is of size 400mmx400mm and is at a clear distance of 250mm from the property line. The bigger column is of size 750mmx750mm. The permissible soil pressure is 300kPa.

PART C

Answer any two full questions, each carries20 marks.

7 a) What is negative skin friction? (5)

b) What is dynamic pile capacity? (5)

c) A group of 9 piles 12m long and 250mm in diameter is to be arranged in a square form in clay with an average unconfined compressive strength of 60kN/m^2. Determine the centre to centre spacing of the pile for group efficiency of 1. Neglect bearing at the tip. α=0.9 (10)

8 a) Explain mass spring model for undamped free vibration (5)

b) Explain with a neat sketch, the wash boring method. What are its advantages and disadvantages? (7)

c) Using modified Hiley'sformula, determine the safe load that can be carried by a pile. The gross weight of the pile is 1400kg, weight of hammer 2000kg, height of fall 91cm, hammer efficiency 70%, average penetration under the last 5 blows is 10mm , coefficient of restitution is 0.55 and the factor of safety is 2.5. assume C=2.5 and e = 0.5 (8)

9 a) Explain in detail the procedure for standard penetration test. What are the corrections to be applied to the N-Value? (15)

b) What are the main objectives of the site investigation? (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: CE305

Course Name: GEOTECHNICAL ENGINEERING – II (CE)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1 a) A water tank is founded on a circular ring type of foundation. The ring is of 2.5m width and its external diameter is 10m. Compute the vertical stress at 2.5m depth beneath the centre of the foundation, if pressure on the foundation is 100kPa. (8)

b) A rectangular footing of size 3m × 2m carries a uniform intensity of loading equal to 100kPa. Determine the vertical stress at 5m depth below the midpoint of a short edge of the footing, using the following data: (7)

m	n		
	0.2	0.4	0.6
0.2	0.0179	0.0328	0.0435
0.4	0.0328	0.0602	0.0801
0.6	0.0435	0.0801	0.1069

2 A 6m high retaining wall supports a two-layered backfill having the following characteristics.Top layer: cohesion=10kPa; angle of internal friction=30^0; unit weight of soil=18kN/m^3; thickness=3m; Bottom layer: cohesion=0.0; angle of internal friction=41.8^0; unit weight of soil=19.2kN/m^3. Determine the totalearth pressure and its location, if tension cracks are likely to develop in the field. (15)

3 a) In spite of a few inherent limitations, the Boussinesq's theory for determination of vertical stress is still widely used. Why? (2)

b) Determine the increase in vertical stress at a depth of 3m beneath the centre of a 2m wide strip footing, if the intensity of loading on the footing is 100kPa. (5)

c) An excavation is to be carried out in a soil having: cohesion=8kPa; angle of internal friction=30^0; unit weight of soil=18.5kN/m^3. What is the maximum depth up to which excavation can safely be done without the sides caving in? (4)

d) State the assumptions in Rankine's theory. (4)

PART B

Answer any two full questions, each carries 15 marks

4 Determine the safe load that can be carried by a circular footing [diameter=1.5m] founded at a depth of 0.9m in a soil with cohesion=55kPa and angle of internal friction=10^0. Water table is at a depth of 2.8m beneath the ground surface. However, the soil above water table is also saturated [γ_{sat}=17kN/m^3] due to capillarity. Nc=9.6; Nq=2.7; Nγ= 1.2. Assume general shear failure to materialise in the field and take factor of safety against shear failure as 3. What will be the %reduction in net safe bearing capacity, if water table rises to the ground surface? (15)

5 a) Mention any one practical situation wherein trapezoidal combined footings are preferred to rectangular combined footings. (2)

b) Design the plan dimensions of a combined footing for the following data: size of columns=300mm×300mm; column loads=1075kN & 925kN; centre to centre distance between columns=4m; clear space available beyond the outer face of both columns=0.10m. Safe bearing capacity=178kPa (13)

6 a) What type of shear failure can be expected for footings, if the subsoil consistsof dense homogeneous coarse grained soil? Draw the typical pressure versus settlement curve of in such a situation. (5)

b) State any 3 causes of differential settlement. (3)

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

PART C

Answer any two full questions, each carries20 marks

7 a) State the I.S. guidelines for estimation of safe load on a single pile, from pile load test results. (4)

b) Clearly differentiate between "initial test" and "routine test" on pile. What is meant by a working pile? (6)

c) A square concrete pile[400mm×400mm] is proposed to be installed in a homogeneous clay stratum[unconfined compression strength=100kPa; unit weight of soil=18kN/m^3; adhesion factor=0.4] to carry a safe load of 233kN., with a factor of safety of 2.5 against shear failure. Design the required length of pile. (10)

8 a) Mention the following aspects related to correctionsto be applied for observed SPT values: Name of the two corrections to be applied, applicable soil types, method of computation. (8)

b) Mention any 2 soils in which auger boring method of soil exploration can be effectively carried out? Also mention applicable depths, and any one limitation of the method. (5)

c) Differentiate between free vibration and forced vibration. (4)

d) Mention any two methods of vibration isolation. (3)

9 a) Write down the procedure for determination of safe load on a single pile in sands. (10)

b) Coefficient of elastic uniform compression(C_u) is needed for finding the natural frequency of foundation-soil system. Mention the factors controlling C_u. (3)

c) State the I.S. guidelines for choosing the minimum number of borings in a soil exploration programme. Find the minimum number of boreholes for a rectangular plot of size 40m ×300m. (7)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CE305

Course Name: GEOTECHNICAL ENGINEERING - II

Max. Marks: 100 Duration: 3 Hours

PART A

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

1 a) State any 3 assumptions in Boussinesq's equation (3)

b) Determine the vertical stress intensity at a point 3 m below ground level and 2.5 cm away from the line of action of a vertical point load of 150kN acting on the ground surface by Boussinesq's equation. (8)

c) State two important differences between Rankine's and Coulomb's earth pressure theories. (4)

2 a) Define active earth pressure. Explain how the intensity of earth pressure exerted by a backfill depends on the movement of wall. (4)

b) A retaining wall with a vertical smooth back is 6 m high. It supports a cohesion less soil (γ = 19kN/m3, ϕ =30˚). The surface of the soil is horizontal and carries a surcharge of 15kPa. Determine the active thrust on the wall. (8)

c) What is the use of Newmark's chart? Explain the procedure for using the chart. (3)

3 a) Define depth of tension crack in cohesive soils and derive an expression for its evaluation. (4)

b) A 4 m high retaining wall contains a cohesion less backfill having the following properties: γ = 16 kN/m^3, γsat =19 kN/m^3,ϕ = 35˚. The water table is 1.5 m below the top of the backfill. Determine the total active thrust exerted by the backfill. (8)

c) Define isobar and specify its practical significance. (3)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Distinguish between general and local shear failure of shallow foundations (4)

b) A square footing of width 2.00 m is constructed at 1.20 m below the ground level in a homogeneous dry sand (γ = 17kN/m^3, ϕ = 30˚). Determine the safe bearing capacity of footing against shear failure with factor of safety 3. N_c =65.4, N_q = 49.4, N_γ = 5.4 (7)

c) With a neat sketch of well foundation mark the various components of well foundation. (4)

5 a) Define the terms safe bearing capacity and allowable bearing capacity (3)

b) Determine the ultimate bearing capacity of a strip footing 1.2 m wide and having the depth of foundation of 1.0 m. The water table reaches at the ground surface (8)

during rainy season. (γsat = 19 kN/m^3, C = 15 kN/m^2, N_c =57.8, N_q = 41.4 and N_γ = 42.4).

c) What are the two criteria for design of rectangular combined footings ? (4)

6 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 5. 0 m between them. The boundary is 0.5 m away from 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. (8)

b) State any two major problems in well sinking and describe any two methods to correct them. (4)

c) What are the limitations of Terzhaghi's bearing capacity theory? (3)

PART C

Answer any two full questions, each carries 20 marks.

7 a) A 50 cm concrete pile is driven in a normally consolidated clay deposit 15 m thick. Cu = 70 kN/m^2, α = 0.9 and Factor of safety is 2.0. Estimate the safe load. (5)

b) List five major objectives of site investigation. (5)

c) What is negative skin friction? What is its effect on the pile capacity? (6)

d) What are corrections applied to standard penetration test value? (4)

8 a) Write IS guide lines for choosing spacing of boreholes (3)

b) Write any two advantages of auger boring compared to wash boring. (4)

c) A bored pile in a clayey soil failed at an ultimate load of 400kN. If the pile is 50 cm diameter and 10 m long, determine the capacity of a group of nine piles spaced 1 m centre to centre both ways. Take Cu = 70 kN/m^2 and α = 0.5. (8)

d) Write Modified Hiley formula and describe each terms in the formula (5)

9 a) What is meant by vibration isolation? List two methods of vibration isolation of footings (3)

b) Determine the natural frequency of a machine foundation having base area 2.2 m x 2.2 m and a mass of 15200kg, including the mass of the machine. Taking Cu = 4x10^4 kN/m^3 . (5)

c) Explain the procedure of determination of safe load from static pile load test (12)

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