Hall Ticket Number:

CE321 (R20)

B.TECH. DEGREE EXAMINATION, SEPTEMBER-2024

Semester VI [Third Year] (Supplementary)

FOUNDATION ENGINEERING

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Distinguish between disturbed and undisturbed soils. CO1
   (b) What is 'bore hole log'? CO1
   (c) State the limitations of static cone test. CO1
   (d) Write any three assumptions of Rankine's theory. CO1
   (e) What is earth pressure at rest? CO1
   (f) The angle of slope and frictional angles of soil in infinite slope are 40° and 50°. What is factor of safety of slope? CO2
   (g) Distinguish between translational and rotational failures. CO2
   (h) Explain the factors governing the location and depth of foundation. CO3
   (i) Define safe bearing capacity. CO3
   (j) Distinguish between shallow and deep foundation. CO3
   (k) Define group efficiency of pile. CO4
   (l) Discuss various factors governing selection of pile. CO4
   (m) Define negative skin friction. CO4
   (n) Enlist various components of well foundation. CO4

UNIT – I

2. (a) Explain briefly about the Standard Penetration Test with neat sketch and the correction to be applied to find N value. (7M) CO1
   (b) Describe with a neat sketch how will you carry out the wash boring method of soil exploration. (7M) CO1

(OR)

3. (a) Describe the Culmann's graphical method of determining the active earth pressure in cohesionless soils (7M) CO1
   (b) Explain briefly the types of retaining walls with neat sketches. (7M) CO1

UNIT – II

4. (a) Explain friction circle method for stability analysis of slopes. (7M) CO2
   (b) An infinite slope is made of clay with the following properties: γ = 18 kN/m^3, γ_{sub} = 12 kN/m^3, C = 36 kN/m^2, ϕ = 30°. If the slope has an inclination of 36° and height equal to 10 m. Determine the stability of slope when (7M) CO2
   (i) Slope is submerged
   (ii) There is seepage to the slope

(OR)

5. (a) Calculate the factor safety with respect to cohesion, of a clay slope laid at 1 in 2 to a height of 12 m, if the angle of internal friction $\phi = 12^0$, C = 30 kN/m^2 and γ = 19kN/m^3. What will be the critical height of slope in this soil? Assume stability number S_n = 0.087. (7M) CO2
   (b) Discuss in brief various types of foundations with neat sketch along with their applicability. (7M) CO3

UNIT – III

6. (a) Discuss in detail IS equation for bearing capacity along with its terms. (7M) CO3
   (b) Determine the ultimate bearing capacity of a strip footing 2 m wide and its base at a depth of 1 m resting on dry sand stratum. Use Terzaghi's theory. Take γ_d = 19 kN/m^3, γ_{sat} = 22 kN/m^3, $\phi = 38^o$, C = 0, N_q = 60 and N_γ = 75. If G.W.T is located at (7M) CO3

(i) 0.5 m below the ground surface
(ii) 0.5 m below the base of the footing.

(OR)

7. (a) A rectangular footing 3 m x 2 m exerts a pressure of 100 kN/m^2 on a cohesive soil having E_s = 5 x 10^4 kN/m^2 and μ = 0.5. Estimate the immediate settlement at the centre, assuming (7M) CO3
   (i) The footing is flexible
   (ii) The footing is rigid
   (b) Explain how to determine the settlement of foundation using plate load test with neat sketch. (7M) CO3

UNIT – IV

8. (a) Explain briefly the classification of pile foundations with neat sketches. (7M) CO4
   (b) Discuss various dynamic pile formula in detail. (7M) CO4

(OR)

9. (a) Draw a neat sketch of components of well foundation and explain functions of each Component. (7M) CO4
   (b) Explain briefly measures to reduce tilts and shifts with neat sketch. (7M) CO4

****

CE321 (R20)

Hall Ticket Number:

CE321 (R20)

B.TECH. DEGREE EXAMINATION, MAY-2024

Semester VI [Third Year] (Regular & Supplementary)

FOUNDATION ENGINEERING

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Define area ratio. CO1
   (b) Discuss the correction applied in SPT test. CO1
   (c) Identify the difference between disturbed & un-disturbed samples. CO1
   (d) Define passive Earth pressure. CO1
   (e) State the assumptions made in Coulomb's Wedge theory. CO1
   (f) Discuss the probable types of failures of a slope with neat sketch. CO2
   (g) Draw a neat sketch of mat foundation. CO3
   (h) Compare shallow foundation with deep foundation. CO3
   (i) State the difference between gross bearing capacity and ultimate bearing capacity. CO3
   (j) Distinguish between immediate settlement and consolidation settlement. CO3
   (k) Define negative skin friction. CO4
   (l) Classify the piles based on material used. CO4
   (m) Classify the wells based on shape. CO4
   (n) Define tilt and shift of a well. CO4

UNIT – I

2. (a) Explain dynamic cone penetration test. (7M) CO1
   (b) Illustrate electrical resistivity method of geophysical investigation of soil. (7M) CO1

(OR)

3. (a) A retaining wall 6 m height retains the backfill of bulk unit weight 19 kN/m^3, C = 20 kN/m^3, angle of internal friction is 30° and with the top horizontal. The backfill carries a surcharge of 30 kN/m^2. Compute the total active and passive earth pressure on the wall and their point of application. Draw the earth pressure distribution diagram. (7M) CO1

(b) Explain Rankine's active earth pressure theory for cohesion less soil and cohesive soil. (7M) CO1

UNIT – II

4. (a) Derive the expression for factor of safety of an infinite slope in cohesionless soil with neat sketch. (7M) CO2

(b) Discuss friction circle method of slope stability analysis with neat sketch. (7M) CO2

(OR)

5. (a) An infinite slope is constructed of a clay soil at a slope angle of 30^0. The ground water level is at the ground surface itself, with seepage parallel to the ground. The soil properties are: C^1 = 15 kN/m^2, ϕ^1 = 22^o, γ_{sat} = 20 kN/m^2. What is the factor of safety against movement along a plane parallel to the ground surface at depths 4 m and 5.5 m? (7M) CO2

(b) Briefly discuss about the various types of footing with neat sketch. (7M) CO2

UNIT – III

6. (a) A circular footing of size 3 m constructed on a soil deposit at a depth of 2 m from the ground surface. The soil is having cohesion C = 30 kN/m^2, angle of shearing resistance ϕ =16^o and unit weight of the soil γ = 20 kN/m^3. Determine the ultimate bearing capacity of soil under circular footing. Assume general shear failure. For ϕ =16 °, Nc = 10, Nq = 3, Nγ = 1.2. (7M) CO3

(b) Discuss how allowable bearing pressure of shallow foundations can be determined using (7M) CO3
(i) Teng's Correlation
(ii) IS code Method

(OR)

7. (a) Explain how to determine the settlement of foundation using plate load test. (7M) CO3

(b) Explain Terzaghi's bearing capacity theory. (7M) CO3

UNIT – IV

8. (a) Discuss various dynamic pile formula in detail along with its terms. (7M) CO4

(b) A group of 16 piles with 4 piles in a row is driven into soft clay extending from ground level to a great depth. The diameter and length of piles were 32 cm and 10 cm respectively. The unconfined compression strength of clay is 120 kN/m^2. If the piles were spaced at 80 cm centre to centre, compute the allowable load on the pile group on the basis of shear failure criteria for a factor of safety of 2.5, Assume adhesion factor/ mobilization around each pile as 0.9. (7M) CO4

(OR)

9. (a) Discuss various forces acting on a well foundation. (7M) CO4

(b) Draw a neat sketch of components of well foundation and explain functions of each Component. (7M) CO4

****

Load (kN)	Size of plate (m)	Settlement (mm)
40	0.3 x 0.3	25
100	0.6 x 0.6	25

UNIT – IV

8. (a) With the help of sketch, explain the load transfer mechanism in a single pile. (7M) CO4

(b) A pile group consisting of 25 piles arranged in a square formation is to support a raft footing. The length and diameter of each pile are 15 m and 300 mm respectively, while their spacing is 85 cm c/c. The foundation soil is normally consolidated clay having cohesion = 5 t/m^2 and density of soil = 1.85 t/m^3. Determine the safe load bearing capacity of pile group. Take $\alpha = 0.8$ and $F_s = 3.0$. (7M) CO4

(OR)

9. (a) Sketch an open well foundation and show the various components of a well foundation and explain the functions of each component. (7M) CO4

(b) Determine the group capacity of 15 piles arranged in 3 rows of diameter 300 mm. If the piles are driven 8 m in to clay with cohesion 25 kN/m^2. Take spacing of piles as 0.8 m (7M) CO4

****

F-2

Hall Ticket Number:

CE321 (R20)

B.TECH. DEGREE EXAMINATION, NOVEMBER-2023

Semester VI [Third Year] (Supplementary)

FOUNDATION ENGINEERING

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) What is overburden correction in SPT? CO1
   (b) Distinguish between inside clearance and outside clearance. CO1
   (c) What is a bore-log? CO1
   (d) Write the equation for the depth of the tensile crack. CO1
   (e) Write the factor of safety equation for slope stability with respect to cohesion. CO2
   (f) List different types of slope failures? CO2
   (g) What is a Taylor stability number? CO2
   (h) Write Terzaghi ultimate bearing capacity equation for a rectangular footing. CO3
   (i) Distinguish between General and Local Shear Failure. CO3
   (j) What is allowable settlement? CO3
   (k) What is meant by differential settlement? CO3
   (l) What is grip length of a well foundation? CO4
   (m) Distinguish between tilts and shifts. CO4
   (n) Write the pile group capacity equation for cohesive soils. CO4

UNIT – I

2. (a) Briefly explain Standard Penetration Test with neat sketch and the corrections to be applied to find 'N' value. (7M) CO1

(b) A retaining wall with a smooth vertical back is 10 m high and retains a two-layer sandy backfill. The top layer is 4 m thick with $\varphi = 320$, $\gamma = 20$ kN/m^3. The bottom layer is 6 m thick with $\varphi = 350$, $\gamma = 22$ kN/m^3. Determine the total active earth pressure. (7M) CO1

(OR)

3. (a) Write the necessity of geophysical methods of soil investigation and briefly explain electrical resistivity method with neat sketch. (7M) CO1

(b) A 5.0 m high vertical wall supports a two layered cohesive backfill with horizontal ground surface. The properties of backfill are as follows: (7M) CO1

(i) Upper Layer 3.0 m depth $\gamma_{sat} = 17.6$ kN/m^3, $c = 7.5$ kN/m^2 and $\phi = 20^o$

(ii) Lower Layer 2.0 m depth $\gamma_{sat} = 19.2$ kN/m^3, $c = 10$ kN/m^2 and $\phi = 20^o$

The free water table stands behind the wall at a depth of 4 m from top, neglecting negative pressure upto a depth of tension cracks, determine the total active pressure and its point of application.

UNIT – II

4. (a) Illustrate the different types of earth slope failures with neat sketches. (7M) CO2

(b) A 5 m deep canal has side slopes 1:1. The properties of soil are $c_u = 20$ kPa, $\phi = 100$, $e = 0.8$ and $G = 2.80$. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion, when the canal runs full. Also find the same in case of sudden drawdown, if Taylor's stability number for this condition is 0.137. (7M) CO2

(OR)

5. (a) Illustrate different types of shallow foundations with neat sketches. (7M) CO2

(b) Along natural slope in an over consolidated clay ($c = 10$ kN/m^2, $\varnothing = 250$, $\gamma_{sat} = 20$ kN/m^3) is inclined at angle 15o to the horizontal. The water table is at the surface and seepage is parallel to the slope. If a plane slip had developed at a depth of 5 m below the surface, determine factor of safety. (7M) CO2

UNIT – III

6. (a) Explain the Terzaghi bearing capacity theory. (7M) CO3

(b) Determine the ultimate bearing capacity of a strip footing, 1.5 m wide with its base of a depth of 1 m, resting on a dry sand stratum. Take $c = 0$ kN/m^2, $\varnothing = 35$, $\gamma_d = 17.5$ kN/m^3. Use Terzaghi theory, if the ground water table is located (7M) CO3

(i) At a depth of 0.5 m below the ground surface and

(ii) At a depth of 0.5 m below the base of the footing.

Take $\gamma_{sat} = 20$ kN/m^3 bearing capacity factors $N_c = 57.8$, $N_q = 41.4$ and $N_\gamma = 42.4$.

(OR)

7. (a) Explain the plate load test to determine the bearing of soils. What are its limitations? (7M) CO3

(b) Plate load tests were conducted in a cohesive soil using two plates of different sizes and the following results were obtained. Find the size of the square footing to carry a load of 800 kN at a settlement of 25 mm. (7M) CO3

(OR)

9. (a) Discuss the causes and remedies for tilts and shifts with neat sketches (7M) CO4

   (b) A group of 9 piles of 10 m length each are arranged in square pattern in sand. Each pile is of 300 mm in diameter with centre to centre spacing of 900 mm. Calculate the ultimate load capacity of the pile group. Take $N_q = 27$, $\phi = 30^{\circ}$, $\gamma = 19\ kN/m^3$. (7M) CO4

****

CE321 (R20)

File-2

Hall Ticket Number:

CE321 (R20)

B.TECH. DEGREE EXAMINATION, JULY-2023

Semester VI [Third Year] (Regular)

FOUNDATION ENGINEERING

Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Distinguish between disturbed and undisturbed sample? CO1
   (b) Define area ratio. CO1
   (c) List out the types of samplers. CO1
   (d) Determine the values of active and passive earth pressure coefficients when $\emptyset = 30^{\circ}$. CO1
   (e) Write the factor of safety equation for slope stability with respect to shear strength. CO2
   (f) How does Bishop's method of analysis of finite slope stability differ from Swedish circle method of analysis? CO2
   (g) What is a compound failure of slope? CO2
   (h) Define bearing capacity of soil. CO3
   (i) Distinguish between ultimate bearing capacity and net ultimate bearing capacity. CO3
   (j) What is the minimum depth of foundation? CO3
   (k) Write the equation for settlement of a footing in cohesionless soil based on SPT. CO3
   (l) What is an end bearing pile? CO4
   (m) List different types of piles based on materials. CO4
   (n) Write the pile load capacity equation for cohesionless soils. CO4

UNIT – I

2. (a) What are the different methods of soil exploration? (7M) CO1

(b) A retaining wall of 4 m height is having a backfill of sandy soil deposit. The properties of the soil are γ = 18.5 kN/m^3, Ø = 32°. Determine the active earth pressure and passive earth pressure at base of the retaining wall. (7M) CO1

(OR)

3. (a) Discuss the design factors affecting the sample disturbances. (7M) CO1

(b) Illustrate the design principles of retaining walls by considering a simple section of Gravity retaining wall. Also discuss the requirements for safe design of retaining walls. (7M) CO1

UNIT – II

4. (a) Derive the equations for factor of safety for infinite slopes of cohesionless soil deposits. (7M) CO2

(b) A long infinite slope of sandy soil deposit having the slope angle 15° and the shear strength parameters c = 0 and Ø = 32°. The dry and saturated unit weights of the soil are γ = 18.5 kN/m^3 and γ_{sat} = 20 kN/m^3. The failure plane is located at a depth of 4.5 m from the slope surface. Determine the factor of safety for dry soil and steady seepage condition. (7M) CO2

(OR)

5. (a) Derive the factor of safety equation for a finite slope using Swedish circle method. (7M) CO2

(b) Determine the safe height of a slope which is to be constructed at an angle of 30° with the horizontal. The required factor of safety with respect to both cohesion and angle of internal friction is 1.5, and the soil has the following properties: C = 10 kN/m^2, Φ = 22.5° and density of soil is 20 kN/m^3. Taylor's stability numbers for mobilized friction angles of 22.5° and 15° are respectively 0.016 and 0.046. (7M) CO2

UNIT – III

6. (a) What are the assumptions of Terzaghi bearing capacity theory? Write the ultimate bearing capacity equations given by Terzaghi. (7M) CO3

(b) A square footing of 1.8 m size is placed over sand of bulk density 20 kN/m^3 and of saturated density 22 kN/m^3 at a depth of 1.0 m below ground. The angle of internal friction of sand is 30°. The Terzaghi's bearing capacity factors N_c = 30.14, N_q = 18.4 and N_γ = 15.1. Determine the ultimate bearing capacity of the soil when there is no effect of water table and when the water table is at base. (7M) CO3

(OR)

7. (a) Explain the types of shear failure experienced by shallow foundations and compare the parameters to decide type of shear failure. (7M) CO3

(b) Design a square footing for a column carrying 2000 kN. The soil in the site has C = 35 kPa, Ø = 0° and γ = 16.5 kN/m^3. Assume the depth of foundation as 1.5 m and factor of safety as 3.0. (7M) CO3

UNIT – IV

8. (a) Classify various types of well foundations. Explain each with a neat sketch. (7M) CO4

(b) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9 m respectively. If the unconfined compression strength of the clay is 90 kN/m^2, and the pile spacing is 90 cm centre to centre, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. (7M) CO4