Code No: **R1641013** **R16** **Set No. 1**

IV B.Tech I Semester Regular Examinations, October/November - 2019

GEOTECHNICAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Define infinite slope and give example with sketch. [2]
   b) Draw the strain versus earth pressure diagram and show the salient points. [3]
   c) Write any two factors that affect bearing capacity of foundation. [2]
   d) Why adhesion factor is taken high in soft clay while estimating pile capacity? [3]
   e) Why wells are not used as foundations now a days? [2]
   f) What is area ratio? [2]

PART–B *(4x14 = 56 Marks)*

2. a) Why upstream slopes fail? Discuss the reasons with neat sketch. [6]
   b) An embankment is inclined at an angle of 35° and its height is 15 m. The angle of shearing resistance is 15° and the cohesion intercept is 200 kN/m^2. The unit weight of soil is 18 kN/m^3. If the Taylor's stability number is 0.06, find the factor of safety with respect to cohesion. Also estimate the critical height of the slope. [8]

3. a) Critically comment on the assumptions of Rankine's earth pressure theory. [6]
   b) A gravity retaining wall retains 7m high backfill, γ = 18 kN/m^3 and ϕ = 30° with a uniform horizontal surface. Assume the wall interface to be vertical, determine the magnitude and point of application of the total active earth pressure force. [8]

4. a) State the basic requirements of a foundation. And also write a note on minimum depth of foundation. [6]
   b) Determine the net ultimate bearing capacity of a rectangular footing, 1.2 m x 3.0 m, placed at 1.8 m below the ground in a saturated clay with a unit weight of 20 kN/m^3. Use Skempton's approach. [8]

5. a) Discuss the group action of piles on load carry capacity in dense sands. [6]
   b) A group of 16 piles arranged in square pattern are driven into a clay deposit whose properties are $\phi' = 0$, c_u =72 kN/m^2 and α = 0.65. The piles are 500mm in diameter, 8m long and spaced at 1.2m center to center. Calculate the capacity of the group neglecting end bearing. [8]

6. a) Discuss the different shapes of cross-sections of wells used in practice, giving the merits and demerits of each. [6]
   b) How do you remediate tilts and shifts of wells? Discuss. [8]

7. a) Describe various methods of drilling holes for subsurface investigations. [8]
   b) Explain the following terms as related to soil sampling:
   (i) Disturbed and undisturbed samples (ii) Representative and non-representative samples (iii) Rock Quality Designation. [6]

Code No: **R1641013** **R16** **Set No. 2**

IV B.Tech I Semester Regular Examinations, October/November - 2019

GEOTECHNICAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Write the factor of safety against a slope made up of pure clay ($\phi = 0^o$). [2]
   b) What is the depth of tension crack in clay backfill? [3]
   c) What is general shear failure? Write a note. [3]
   d) Why bored piles are used in clay? [2]
   e) Write a note on Lacey's silt factor. [2]
   f) What is undisturbed soil sample? [2]

PART–B *(4x14 = 56 Marks)*

2. a) Discuss the Fellinius method for location of critical center of rotation. [7]
   b) Discuss the Taylors stability number approach for factor of safety against slope failure. [7]

3. a) Differentiate critically between Rankine and Coulomb theories of earth pressure. [4]
   b) A retaining wall, 6 m high, retains dry sand with an angle of friction of 30° and unit weight of 16.2 kN/m^3. Determine the active earth pressure force and its position from bottom of wall. If the water table rises to the top of the wall, determine the increase in the thrust on the wall. Assume the submerged unit weight of sand as 10 kN/m^3. [10]

4. a) Write the assumptions of Terzaghi are bearing capacity theory and discuss their limitations. [4]
   b) Determine the size of a square footing at the ground level to transmit a load of 900 kN in sand unit weight 18 kN/m^3 and having an angle of shearing resistance of 36^0 (N_γ = 46, N_q = 43). Factor of safety is 3. What will be the modification in the result, if the footing may be placed at a depth of 1 m below ground surface? Assume, in this case, the water table may rise to the ground surface. Submerged unit weight = 9 kN/m^3. Use the Terzaghi's theory. [10]

5. a) Discuss about pile load tests and interpretation of results. [6]
   b) A group of 12 piles each having a diameter of 500 mm and 30m long supports a column. The piles are arranged in 3 rows and spaced at 1.25m c/c. The properties of the foundation soil (clay) are as follows: Unit weight = 11 kN/m^3, Unconfined compressive strength = 100kN/m^2. Determine the capacity of the pile group. Assume adhesion factor as 0.6. [8]

6. a) Discuss the various kinds of forces likely to act on a well foundation. [7]
   b) What is 'Grip Length' of well? What are the considerations in the determination of the grip length? [7]

7. a) Discuss with neat sketches any two boring methods used in soil exploration. [7]
   b) Write a brief note on Geophysical method "Electrical Resistivity Method" [7]

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Code No: **R1641013** **R16** **Set No. 3**

IV B.Tech I Semester Regular Examinations, October/November - 2019

GEOTECHNICAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A *(14 Marks)*

1. a) Differentiate finite and infinite slope. [2]
   b) A 6m high backfill of $\phi = 30^o$ has surcharge 120 kPa on top. Estimate the active earth pressure. [3]
   c) When do you apply dilatancy correction for measured SPT N value? [3]
   d) What are the drawbacks in dynamic formulae for pile capacity? [2]
   e) What is scour depth? [2]
   f) What is the use of undisturbed soil samples? [2]

PART–B *(4x14 = 56 Marks)*

2. a) Why slopes fail? Discuss different types of slope failure. [6]
   b) What are the reasons for steady seepage in an earth dam? Discuss its effect on downstream slope failure. [8]

3. a) Explain the following with neat sketches (i) active earth pressure (ii) at rest earth pressure and (iii) passive earth pressure. [6]
   b) A retaining wall, 8m high, retains a cohesionless backfill. The top 3 m of the fill has a unit weight of 17 kN/m^3 and $\phi = 33^o$ and the rest has unit weight of 18.5 kN/m^3 and $\phi = 28^o$. Draw the active earth pressure distribution diagram. Also find the total active earth thrust and its location from the bottom of the wall. [8]

4. a) Discuss the tolerable settlements of various structures. [6]
   b) A 1.8 m square column is founded at a depth of 1.8 m in sand, for which the corrected N- value is 24. The water table is at a depth of 2.7 m. Determine the net allowable bearing pressure for a permissible settlement of 40 mm and a factor of safety of 3 against shear failure. [8]

5. a) What is group effect and how will you estimate the capacity of a pile group in sand? Discuss. [6]
   b) A square pile 0.3m size penetrates a soft clay with unit cohesion of 85 kN/m^2 for a depth of 16 m and rests on stiff soil. Determine the capacity of the pile, if the unit cohesion of stiff clay is 180 kPa. Assume an adhesion factor of 0.70. [8]

6. a) Discuss various shapes of well foundation with their practical relevance. [7]
   b) What is grip length of well foundation? Discuss how it is estimated as per the Indian standard code of practice. [7]

7. a) How do you judge the disturbing effect of soil-sampler? [7]
   b) Explain briefly how do you plan an exploration programme for a housing colony. [7]

Code No: **R1641013** **R16** **Set No. 4**

IV B.Tech I Semester Regular Examinations, October/November - 2019

GEOTECHNICAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

1. a) Write the expression for Taylor's stability number. [3]
   b) Write the advantages of graphical methods in earth pressure calculation. [2]
   c) When do you prefer allowable bearing capacity? Write a note. [3]
   d) What are displacement piles? [2]
   e) What is grip length of wells? [2]
   f) What is core recovery ratio? [2]

PART–B *(4x14 = 56 Marks)*

2. a) Discuss the draw backs of slope stability analysis by Method of Slices. [6]
   b) An embankment 10 m high is inclined at an angle of 35° to the horizontal. A stability analysis by the method of slices gives the following forces per running meter: $\Sigma T = \Sigma$ Shearing forces = 500 kN, $\Sigma N = \Sigma$ Normal forces = 1000 kN and $\Sigma U = \Sigma$ Pore water pressure forces = 250 kN. The length of the failure arc is 30 m. Laboratory tests on the soil indicate the effective values c^1 and ϕ^1 as 25 kN/m^2 and 15° respectively. Determine the factor of safety of the slope with respect to (i) shearing strength and (ii) cohesion. [8]

3. a) Explain how you will determine active pressure by Culmann's graphical method for cohesionless soil without surcharge line load? [10]
   b) Discuss depth of tension crack and unsupported height in clay backfill. [4]

4. a) Explain what is meant by 'safe bearing capacity' of soil. Indicate how the bearing capacity shallow footing in a given soil can be calculated from the strength characteristics of the soil. [7]
   b) Compute the safe bearing capacity of a continuous footing 2.0 m wide and resting on a clayey sand at a depth of 1.5 m if c = 16 kN/m^2, $\phi = 25^0$, γ_{sat} = 19 kN/m^3, N_c = 25, N_q = 12.5, N_γ = 10 and F.S.=3.0. [7]

5. a) What are the circumstances under which a pile foundation is used? [4]
   b) A group of 16 piles arranged in square pattern are driven into a clay deposit whose properties are $\phi' = 0$, c_u =72 kPa and α=0.65. The piles are 500mm in diameter, 8m long and spaced at 1.2m center to center. Calculate the capacity of the group neglecting end bearing. [10]

6. a) What are the circumstances under which a well foundation is more suited than other types? Sketch and describe the various components of a well foundation, indicating the function of each. [7]
   b) Enumerate the various methods for the analysis of lateral stability of a well acted on by horizontal forces. [7]

7. a) List various geophysical methods. Discuss their limitations and uses. [6]
   b) Discuss with neat sketch how the pressuremeter test is conducted in-situ. [8]