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CODE NO: 07A70101 | R07 | SET - 1

IV B.TECH - I SEMESTER EXAMINATIONS - MAY, 2011
GEOTECHNICAL ENGINEERING-II
(CIVIL ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. a) Sketch a typical Bore log and state its features.
   b) Describe the procedure to conduct the plate load test with a sketch and state its limitations. [4+12]

2. a) Explain the method of slices to analyse the stability? Derive an expression for the factor of safety.
   b) A long natural slope in an over consolidated Clay (c^1 = 10 kN/m^2, ϕ=25^0, γ_{sat}= 20 kN/m^3) is inclined at 10^0 to the horizontal. The water table is at the surface and the seepage is parallel to the slope. If a plane slip had developed at a depth of 5m below the surface, determine the factor of safety. Take γ_w= 10 kN/m^3. [8+8]

3. a) What is meant by passive earth pressure? Explain.
   b) A 6.5 m high vertical retaining wall supports a back fill with horizontal upper surface. The top 2.5 m of the fill is clay with unit weight 18 kN/m^3, cohesion 10 kN/m^2 and angle of internal friction 18^0. The bottom 4 m of the fill is sand with unit weight 20 kN/m^3 and angle of internal friction 24^0. Determine the total active earth pressure per meter length of the wall and its point of application after neglecting negative pressure. [4+12]

4. A masonry retaining wall 1.0m wide at the top and 3.0m wide at the base and height 4m has a vertical back face and retains soil which exerts a total earth pressure of 40 kN/m^2 and acts at a height of 1.5m above the base. If the coefficient of friction between the base of the wall and the soil below is 0.5, compute the factor of safety against sliding and overturning failures. [16]

5. a) List out different types of foundations. State the circumstances to go for combined foundations.
   b) A continuous footing of width 2.5m rests 1.5m below the ground surface in clay. The unconfined compressive strength of the clay is 150kN/m^2. Calculate the ultimate bearing capacity of the footing. When there is no effect of water table and when water table reaches ground surface. Take γ=19kN/m^3, γ_{sat}=20kN/m^3. [6+10]

6. a) Distinguish between immediate and consolidation settlements. What are the limits of maximum and differential settlements according to I.S. codes?
   b) A raft foundation of size 20m X 30m exerts a uniform pressure of 180kN/m^2 on sub soil. Determine the immediate settlement of soil by assuming E= 45Mn/m^2 and poisons ratio as 0.5. [8+8]

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7. A pile group consisting of 9 piles is arranged in 3 rows with 3 piles in each row. Diameter of each pile is 30 cm and spacing is 1.0m. Length of pile is 9m. The piles are driven completely in clayey soil having unconfined compressive strength of 80kN/m^2. The piles are designed as frictional. Determine the capacity of pile group. Take α =0.7. [16]

8. a) What are the forces acting on a well foundation?
   b) Describe the design procedure of steining of well foundation. [8+8]

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(CIVIL ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. a) State the objectives of soil exploration.
   b) Describe briefly about the pressure meter test and state its applications. [6+10]

2. a) Derive an expression for the factor of safety of infinite slope in submerged cohesion less soils.
   b) Calculate the safe height for an embankment rising 70^0 to the horizontal and to be made with a clayey soil having unit weight of 16 kN/m^3, $\phi = 15^0$ and a cohesion of 20 kN/m^2. Factor of safety may be taken as 2.5. Value of stability number N, corresponding to slope angle $\alpha = 70^0$ and $\phi = 15^0$ is 0.14. [6+10]

3. a) Differentiate between Rankine's and coulomb's theories of lateral earth pressures.
   b) A retaining wall with soft saturated clay back fill is 6m high. The unit weight of clay is 16 kN/m^3 and unit cohesion is 17 kN/m^2. Determine
      i) Maximum depth of tensile cracks.
      ii) Total active earth pressure before cracks occur and
      iii) Active earth pressure after the cracks. [6+10]

4. An L–shaped retaining wall is constructed to retain dry sand. The unit weight of sand is 17kN/m^3 and the angle of shearing resistance is 32^0.The base of the wall is placed 6.0m below the top of the backfill. The thickness of the base and that of the stem is 0.4m. The base width is 3.5m. Unit weight of masonry is given as 22kN/m^3. The angle of friction between the concrete and the foundation material can be taken as 20^0 and Allowable bearing capacity as 220kN/m^2. Check the stability of the retaining wall against overturning and maximum pressure. [16]

5. a) Define the following:
      i) Net ultimate bearing capacity.
      ii) Unit soil pressure.
      iii) Allowable bearing capacity. [16]
   b) A square footing 1.8mx1.8m is placed over loose sand of bulk density 1.6g/cc, saturated density 1.82g/cc and at a depth of 0.8m. The angle of shearing resistance is 30^0. Determine the ultimate bearing capacity when there is no effect of water table and when it is submerged (for $\phi = 30^0$, Nc=30.14, Nq=18.4 and Nγ=15.1). [6+10]

6. a) Differentiate between Safe bearing Capacity and Allowable bearing capacity.
   b) A Normally consolidated clay layer 2m thick is sandwiched between two sand layers. The average overburden stress at the middle of clay layer can be taken as 160kN/m^2. Due to construction of a structure there is an increase in effective

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vertical stress of 40 kN/m^2 at the middle of clay layer. The liquid limit of clay layer is 60% and the initial void ratio is 0.9. Estimate the primary settlement. [4+12]

7. a) What are the limitations of the dynamic pile formulae.
   b) A R.C.C. pile of size 30cm X 30cm and 10m long is driven into coarse sand with unit weight of 16kN/m^3 and angle of internal friction of 31^0. What is the allowable load on the pile? For $\varphi=31^0$, N q= 16and N γ = 14.Take K=1.0 and factor of safety of 3.0. [6+10]

8. Sketch an open well foundation and show the various components. Explain the functions of various components. [16]

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(CIVIL ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. a) Enumerate the types of soil samples and distinguish them.
   b) Describe the procedure to conduct the Standard Penetration Test and state the corrections to be applied. [6+10]

2. a) What are the modes of failure of slopes? Illustrate with sketches.
   b) An embankment is constructed at an angle of 60^0 to the horizontal. The cohesive strength of the embankment material is 40 kN/m^2 and the angle of shearing resistance is 0. Its unit weight is 18 kN/m^3. Calculate the safe height of the embankment for a factor of safety of 1.5. Assume the stability number as 0.91. [6+10]

3. a) What is earth pressure at rest? Derive an expression for it in terms of Poisson's ratio.
   b) A retaining wall with a smooth vertical back is 8m high and retains a horizontal backfill (c=5 kPa, $\phi=35^0$, γ=14kN/m^3 above water table, 18 kN/m^3 below water table). The back fill carries a surcharge of 20 kN/m. The water table is at a depth of 3m below the surface of the backfill. Calculate the magnitude and line of action of resultant active earth pressure. [6+10]

4. A masonry retaining wall 1.2m wide at the top and 3.6m wide at the base is 4.9m high with a vertical back face. The unit weight of sand is 17kN/m^3 and the angle of shearing resistance is 32^0. Unit weight of masonry is given as 22kN/m^3. Determine the maximum and minimum intensities of pressure at the base of the wall and also check for stability against sliding. [16]

5. a) Describe how Meyerhof's theory is better than Terzaghi's bearing capacity theory.
   b) A square footing carries a load of 800 kN. The depth of the footing is 1.5m. The properties of the soil are c=0, $\phi= 38^0$, and γ=18.5kN/m^3. Determine the size of the footing for a factor of safety of 3 against shear failure. What will be the changes in the size of the footing, if the water table rises to ground level. (for $\phi= 38^0$, Nc=52, Nq=49and Nγ=64). [6+10]

6. a) Discuss the situations for adopting the SPT test for determining the bearing capacity.
   b) The following results were obtained from a plate load test conducted in a homogeneous sandy soil with a standard plate of size 0.3m X 0.3m at depth of 1.5m below the ground level. Determine the allowable load which a footing of 1.5m X 1.5m can carry safely when the footing is placed at same depth. [6+10]

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Applied Pressure (kPa)	25	50	100	200	300	400	500
Settlement (mm)	0.5	0.9	1.8	3.5	5.6	8.4	13.2

7. A group of 16 piles arranged in square pattern are driven into a clay deposit whose properties are $\varphi = 0$, $C_u = 72$ kN/m^2 and $\alpha = 0.65$. 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. [16]

8. A cylindrical well of external diameter 6m and internal diameter 4m is sunk to a depth 16m below the maximum scour level in a sand deposit. The well is subjected to a horizontal force of 1000 kN acting at a height of 8m above the scour level. Determine the total allowable equivalent resisting force due to earth pressure, assuming that
   a) The well rotates about a point above the base, and
   b) The well rotates about the base.

   Assume $\gamma^1 = 10$ kN/m^3, $\phi = 35^0$ and factor of safety against passive resistance = 2. Use Terzaghi's approach. [16]

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(CIVIL ENGINEERING)

Time: 3hours **Max. Marks: 80**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. a) Enumerate different types of Samplers and state the criteria for saying the sample collected is Undisturbed.
   b) What are different boring methods of subsoil exploration? Explain wash boring method. [6+10]

2. a) Derive an expression for the factor of safety of infinite slope in cohesive soil when there is steady seepage along the slope.
   b) Stability analysis by the method of slices for 1:1 slope on the critical slip gave the following results.
   Sum of tangential forces = 150 kN
   Sum of normal forces = 320 kN
   Sum of neutral forces = 50 kN
   Length of failure surface = 18 m
   Angle of shearing resistance = 15^0
   Effective cohesion = 20 kN/m^2
   Calculate the factor of safety with respect to shear strength. [8+8]

3. a) Explain Culmann's graphical method for estimating active earth pressure.
   b) A retaining wall, 8m high, with a smooth vertical back, retains a clay backfill with c^1 = 15 kN/m^2, $\phi^1 = 15^0$ and γ = 18 kN/m^3. Calculate the total active thrust on the wall assuming that tension cracks may develop to the full theoretical depth. [8+8]

4. An L–shaped retaining wall is constructed to retain dry sand. The unit weight of sand is 17kN/m^3 and the angle of shearing resistance is 32^0.The base of the wall is placed 6.0m below the top of the backfill. The thickness of the base and that of the stem is 0.4m. Unit weight of masonry is given as 22kN/m^3.The base width is 3.5m. The angle of friction between the concrete and the foundation material can be taken as 20^0. Check the stability of the retaining wall against sliding and tension at the base. [16]

5. a) What are the points to be kept in consideration for locating of depth of footing.
   b) The foundation for a Square footing of width 2m is to be founded at a depth of 1.5m. The soil properties are c=0, $\phi = 36^0$, γ=18.2 kN/m^3, γ_{sat}=20kN/m^3. Determine the ultimate bearing capacity, when the water table is at
      a) 1m below ground level.
      b) 1m below foundation level.
      (for $\varphi = 36^0$, Nc = 52, Nq 32& N γ = 35). [6+10]

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6. a) What is the significance of permissible settlement? State the permissible settlements for Isolated and raft foundations in clays and Sandy Soils.
   b) Determine the allowable bearing capacity of a 1.5m X 1.5m square footing placed at a depth of 2.0m in a sandy deposit having a unit weight of 19kN/m^3 with SPT value of 37. Water table is at depth of 1.5m. Determine the allowable bearing capacity for 50mm permissible settlement after applying suitable corrections for SPT value. [6+10]

7. a) What is negative skin friction in piles? Explain.
   b) In a two layered cohesive soil, bored piles of 300mm are installed. The top layer has a thickness of 5m and the bottom one is of considerable depth. The "c" value of top layer is 40kN/m^2 and that of the bottom is 100kN/m^2. Determine the length of the pile required to carry a safe load of 400kN. Assume a F.S. of 3. [6+10]

8. Briefly outline the causes of Tilts and Shifts in well foundations and the methods adopted for rectifying them. [16]

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