Code.No: 07A70101 | R07 | SET-1

**IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010**
**GEOTECHNICAL ENGINEERING-II**
**(CIVIL ENGINEERING)**

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

**Answer any FIVE questions**
**All questions carry equal marks**
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1. a) Differentiate un-disturbed and disturbed soil samples.
   b) Explain in detail the test set up and procedure of plate load test as per IS: 1885 including the analysis of data and its limitations. [16]

2. a) Describe the conditions in which "Non-circular slip planes" may occur.
   b) Explain the basis for Taylor's stability number and the procedure of its use.
   c) Explain the stability of an earthen dam in "full reservoir" and "sudden draw down" conditions. [16]

3. a) Explain the earth pressure in active, passive and at rest conditions.
   b) A 9m high retaining wall is supporting a back fill consisting of two types of soils. The water table is located at a depth of 5m below the top. The properties of soil from 0 to 3m include c = 0 kN/sqm; $\Phi = 33^0$; $\gamma$ = 17 kN/cum and those for soil from 3m to 9m include c = 0 kN/sqm; $\Phi = 40^0$; $\gamma$ = 18.50 kN/cum, $\gamma$ sub = 20.50 kN/cum. Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall. [16]

4. A trapezoidal gravity retaining wall of height 6m with top and bottom widths as 0.45m and 1.20m respectively is constructed in RCC with a unit weight of 25 kN/cum. Its bottom is resting 2m below the GL on soil having c = 0 kN/sqm; $\Phi = 36^0$; $\gamma$ = 18kN/cum; the friction angle is 2/3 of $\Phi$. The allowable bearing capacity of the soil for this case is found to be 200 kN/sqm. The wall is supporting the 4m thick back fill above GL made of soil having c = 0 kN/sqm; $\Phi = 30^0$ ; $\gamma$ = 17.50 kN/cum. Analyse the stability of wall against overturning, sliding and bearing capacity. [16]

5. a) What is a strip footing ? When it is preferred?
   b) Enumerate the similarities and differences between Terazaghi's and Mayerhof's bearing capacity theories.
   c) It is proposed to lay a suitable type of foundation at a depth of 1.50m below the GL on soil a c-$\Phi$ soil with c=30 Kpa and $\Phi$=25°, $\gamma$=17.50 kN/cum. Given Nc'=14.80; Nq'=5.60; N$\gamma$'=3.20. Estimate the ultimate bearing capacity of a
      (i) 2m wide strip footing
      (ii) 2m wide square footing
      (iii) 2m wide circular footing.
      Comment on the results. [16]

6. a) Differentiate "Uniform Settlement" with "Differential Settlement". Which of them is more detrimental to the structure and why?

b) Determine the total settlement of the foundation, for the conditions given below:

**Ground Level / GWT** (+) 0.00 m

**SAND** with γsat = 20.00 kN/cum

2.5m wide square footing transmitting a contact pressure of 350 kPa

**Foundation level** (-) 2.00 m

**FULLY SATURATED COMPRESSIBLE CLAY**

γ sat = 21.50 kN/cum, LL=98%, e0=1.00, μ=0.24, Es=18500 kPa

Iw=1.05 (-) 6.00 m

**Massive sheet rock**

Adopt distribution of stress as per 2V to 1H rule. Neglect the secondary consolidation settlement. [16]

7. a) A 300mm dia. Pre-cast RCC pile is driven in to a clay bed to a depth of 9m. The average properties of the clay along the shaft of pile include, c = 40 kPa; α = 0.74. However, the un-confined compressive strength of clay at tip of the pile was found to be 120 kPa. Estimate the safe load carrying capacity of the pile with a FOS of 3.

b) Explain the construction and use of "Under-reamed Pile foundations".

c) State the procedure for estimation of settlement of Pile groups. [16]

8. a) Describe various types of Caisson Foundations and comment on their suitability.

b) Explain in detail the procedure of "Sinking of Well foundations". [16]

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Code.No: 07A70101 | R07 | SET-2

**IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010**
**GEOTECHNICAL ENGINEERING-II**
**(CIVIL ENGINEERING)**

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

**Answer any FIVE questions**
**All questions carry equal marks**
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1. a) Explain various methods of soil exploration and comment on suitability of each of them.
   b) Write a detailed note on the test set up and procedure of Standard Penetration Test including the corrections to be applied. [16]

2. a) Compare the "Swedish Slip Circle method" with "Method of slices".
   b) Explain Bishop's simplified method for determination of factor of safety of a finite slope.
   c) An excavation has to be made with an inclination of 40° in a soil with c'=40 kPa, Φ'=10° and γ=18 kN/cum. What is the maximum height of the slope with a factor of safety of 2.01. The Taylor's stability number for the above conditions is given as 0.097. [16]

3. a) Compare the Rankine's and Coulomb's theories for computation of earth pressure, critically and suggest the suitability of these methods.
   b) A 8m high retaining wall is supporting a c-Φ backfill having c=40 kN/sqm ; Φ=24° ; γ=18.50 kN/cum. Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall.
   c) What is the effect of submergence on active and passive earth pressures? [16]

4. a) Design a gravity retaining wall of height 3m with uniform thickness (ie. rectangular in cross section) constructed in RRM with a unit weight of 24 kN/cum. The average properties of soil from top to bottom of wall include c=0 kN/sqm ; Φ=36° ; γ=18kN/cum; the friction angle is 2/3 of Φ. The allowable bearing capacity of the soil for this case is found to be 200 kN/sqm. Analyse the stability of wall against overturning, sliding and bearing capacity.
   b) Explain the significance of weep holes in performance of retaining walls. [16]

5. a) What is a raft foundation ? When it is preferred?
   b) Design a strip footing for a load bearing wall transmitting a force of 200 kN/m proposed to be laid at a depth of 1.50m below the GL on a c-Φ soil with c=40 Kpa and Φ=20°, γ=17 kN/cum. Given Nc'=11.80 ; Nq'=3.90 ; Nγ'=1.70. [16]

6. a) What is "Proportioning of Footings" ? Explain its objective and the procedure.
   b) Determine total settlement of the foundation, for the conditions given below:

**Ground Level / GWT** (+) 0.00 m

**SAND** with γsat = 20.50 kN/cum
2m wide square footing transmitting a contact pressure of 320 kPa

**Foundation level** (-) 2.00 m

**FULLY SATURATED COMPRESSIBLE CLAY**
γ sat = 21.00 kN/cum, LL=108%, e0=1.05, μ=0.28, Es=19500 kPa
Iw=1.05 (-) 5.00 m

**Massive sheet rock**

Adopt distribution of stress as per 2V to 1H rule. Neglect the secondary consolidation settlement. [16]

7. a) A group of 20 piles, arranged in 4x5 pattern are provided in a Clay deposit to a depth of 12m.The size of each pile is 600mm dia provided at a c/c spacing of 1.80m. The average properties of the clay are qu=160kPa, adhesion factor=0.58. Determine the safe load carrying capacity of the pile group. Adopt FS=2.50.
   b) Explain the "Pile Load Tests" in detail. [16]

8. a) With the help of a neat sketch, show the components of an "Open Caisson" and explain the function of each component.
   b) Discuss the design procedure of Caisson Foundations. [16]

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Code.No: 07A70101 | R07 | SET-3

**IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010**
**GEOTECHNICAL ENGINEERING-II**
**(CIVIL ENGINEERING)**

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

**Answer any FIVE questions**
**All questions carry equal marks**
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1. a) Explain various methods of boring adopted in soil investigations.
   b) Explain in detail the test set up and procedure of "Pressure Meter Test" including the analysis of data and its suitability. [16]

2. a) Discuss various types of failure of slopes and explain the necessary conditions for each of them to occur.
   b) Explain the method of slices for estimation of factor of safety of finite slopes. Also, obtain the expression for factor of safety of a c- Φ slope.
   c) Describe the stability of slope of an earthen dam in "sudden draw down" conditions. [16]

3. a) A 10m high retaining wall is supporting a back fill consisting of two types of soils. The water table is located at a depth of 6m below the top. The properties of soil from 0 to 4m include c=30 kN/sqm ; Φ=30° ; γ=17 kN/cum and those for soil from 4m to 10m include c=10 kN/sqm ; Φ=40° ; γ=18.50 kN/cum, γsat =20.50 kN/cum. Plot the distribution of active earth pressure and determine the magnitude and point of application of total active earth pressure acting on the retaining wall.
   b) Explain the procedure of Culmann's graphical method for computation of earth pressure. [16]

4. a) A gravity retaining wall of height 3m with uniform thickness (ie. rectangular in cross section) of 1.20m is constructed in RRM with a unit weight of 24 kN/cum. The average properties of soil from top to bottom of wall include c=0 kN/sqm ; Φ=30°. Analyse the stability of wall against overturning when the entire backfill is
   (i) moist with a unit weight of 18 kN/cum
   (ii) submerged (consider the saturated unit weight in submerged conditions as 19.80 kN/cum).
   b) Explain the procedure of re-computation of pressure when tension is present at base. [16]

5. a) State and explain the assumptions in Terazaghi's Bearing Capacity Theory.
   b) Determine the ultimate bearing capacity of a 2m dia circular footing as shown below.

**Ground Level** (+) 0.00 m

**SAND** with $\gamma$ = 18.50 kN/cum
2m wide square footing transmitting a contact pressure of 120 kPa

**Foundation level & GWT** (-) 1.50 m

**FULLY SATURATED CLAYEY SAND**
$\gamma$ sat = 20.00 kN/cum, qu=80 kPa, $\Phi$=40°
Nc=95.70 ; Nq=81.30 ; $N_\gamma$=100.40

(-) 5.00 m

6. a) A SPT was conducted at a depth of 3m below the GL. The observations were recorded as 14/18/24. The correction for over burden was read as 1. Apply correction for dilatancy. If a 2m wide square footing is proposed at this level, estimate the allowable bearing pressure for a permissible settlement of 40mm based on the penetration resistance (N" value) as per IS:6403-1981.
   b) State the codal provisions pertaining to permissible / allowable settlement of structures. [16]

7. a) Give classification of piles.
   b) A group of 15 piles of 450mm diameter each are arranged in 3 x 5 pattern to a depth of 9m in a 16m thick medium stiff clay. The average unconfined compressive strength of clay is found to be 120 kPa. The adhesion factor between concrete and in-situ clay is found to be 0.58. Estimate the safe load carrying capacity of the pile group with an overall factor of safety of 3.0, if the center to center spacing of piles is 0.9m. [16]

8. a) Describe the terms "Scour Depth", "Grip Length". How they are related in finalizing the depth of sinking of caissons.
   b) With the help of neat sketch, show the components of a "Pneumatic Caisson" and explain their function. Also explain the procedure of sinking of "Pneumatic Caissons". [16]

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Code.No: 07A70101 | R07 | SET-4

**IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010**
**GEOTECHNICAL ENGINEERING-II**
**(CIVIL ENGINEERING)**

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

**Answer any FIVE questions**
**All questions carry equal marks**
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1. a) Explain the method of collection of sample in Cohesion-less soils including the description of the sampler used.
   b) Describe the factors governing depth of investigation.
   c) Explain the "Log of Bore Hole" details. [16]

2. a) Differentiate finite and infinite earth slopes. Give suitable examples.
   b) Explain the "Swedish Slip Circle" method and derive the factor of safety for a slope in cohesive soils.
   c) It is proposed to construct a highway embankment using a c-Φ soil having c=20 kPa ; Φ=10°, γ=17 kN/cum. Determine the critical height up to which the embankment can be built with an inclination of 29° with a factor of safety of 1.50. Given the Taylor's stability number for the conditions as 0.0737. [16]

3. a) From the plastic equilibrium equation show that, the cohesion of back fill reduces the active earth pressure and increase the passive earth pressure.
   b) Explain the procedure for computation of active earth pressure in case of backfill with its top inclined to horizontal .
   c) A 7m high retaining wall is supporting a back fill consisting of two types of soils. The water table is located at a depth of 5m below the top. A capillary raise of 0.90m was found. The properties of soil from 0 to 3m include c=0 kN/sqm ; Φ=18° ; γ=16.50 kN/cum and those for soil from 3m to 7m include c=0 kN/sqm ; Φ=36° ; γ=18 kN/cum, γsub =20 kN/cum. A surcharge of 200 kPa is applied on the top of backfill. Plot the distribution of active earth pressure and determine the magnitude and point of application of total active earth pressure acting on the retaining wall. [16]

4. a) A gravity retaining wall of height 3m with uniform thickness (ie. rectangular in cross section) of 1.20m is constructed in RRM with a unit weight of 24 kN/cum. The average properties of soil from top to bottom of wall include c=0 kN/sqm ; Φ=30°. Subsequently, 1m high fill is placed on top of the existing backfill after constructing a 0.60m thick wall above the existing wall matching with the backfill side face of wall (ie., the offset is provided on the otherside of backfill) Analyse the stability of wall against overturning before and after raising the height of backfill.
   b) Differentiate local stability with global stability of the retaining systems. [16]

5. a) Explain the types of shear failures experienced by shallow foundations. Mention the parameters to decide type of shear failure.

b) A 2m wide square footing is laid at a depth of 1.20 m below the GL on a c-Φ soil with c=40 Kpa and Φ=20°, γ=17 kN/cum. Given Nc'=11.80 ; Nq'=3.90 ; Nγ'=1.70. Using Terazaghi's theory, compute the ultimate bearing capacity (qf) when the GWT is
(i) 5m below GL
(ii) 2m below GL
(iii) at GL.
Assume the change in shear parameters due to saturation is negligible. [16]

6. a) Explain the importance of significant depth in settlement analysis.

b) Determine total settlement of the foundation, for the conditions given below:

**Ground Level** (+) 0.00 m

**SAND** with γ = 18.50 kN/cum
2m wide square footing transmitting a contact pressure of 120 kPa

**Foundation level** (-) 2.00 m

**FULLY SATURATED COMPRESSIBLE CLAY**
γ sat = 20.00 kN/cum, LL=110%, e0=1.20, μ=0.20, Es=19500 kPa
Iw=1.05 (-) 5.00 m

**Massive sheet rock**

Adopt distribution of stress as per 2V to 1H rule. Neglect the secondary consolidation settlement. [16]

7. a) A 300mm wide square RCC pile is installed in a sandy strata to a depth of 10m.The average properties of the sand are φ=40º, Nq=64.20, K=1.5, δ=2/3(φ). Determine its ultimate load carrying capacity, if the critical depth factor is 20

b) Write a note on "Dynamic formulae" and comment on their validity (3). [16]

8. a) What is a "Pneumatic Caisson" ? Explain the circumstances in which they are preferred.

b) Describe the terms "Tilt" and "Shift" in sinking of wells and state their limits prescribed in IS:3955. Explain the measures for their correction. [16]

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