B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Geotechnical Engineering - II

P. Pages : 2 **NIR/KW/18/3406**

Time : Three Hours Max. Marks : 80

* 1 9 5 6 *

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Explain in detail standard penetration test. **6**

b) Compute the area ratio of a thin walled tube sampler having an external diameter of 58 mm and wall thickness of 2.50 mm. Do you recommend this sampler to obtain undisturbed samples and why? **7**

OR

2. a) What are geophysical methods Explain any one method with its limitations. **6**

b) What are different types of soil samplers and explain any one. **7**

3. a) Explain Taylor's stability number. **7**

b) Explain friction circle method with a neat sketch. **6**

OR

4. An embankment is to be made of sandy clay has $r = 18.5 kN/m^3, c = 30 kN/m^2 \& \phi = 20^o$. The slope and height of the embankment are 1.6:1 and 10 m respectively. Find factor of safety using method of slices. Assume $\alpha_a = 20^o$ and $\alpha_b = 35^o$. **14**

5. a) A 6m masonry retaining wall has to retain b backfill of sandy soil having unit weight of 18.5 $kN/m^3 \& \phi = 32^o$. The surface of the backfill is inclined at an angle of 10º to the horizontal. determine the magnitude & point of application of the active thrust. Assume Angle of wall friction = 20º **7**

b) Explain Culman's graphical method for determining of active earth pressure. **7**

OR

6. a) Explain in detail types of lateral earth pressure. **7**

b) A retaining wall has following details. **7**

i) Height of wall = 7m

ii) Batter angle = 10º

iii) Angle of wall friction = 20º

iv) Unit wt. of soil = 16.5 kN/m^3.

v) Angle of internal friction = 30º.

vi) Surcharge angle = 10º

Compute the total active thrust on a wall, use Rebhann's method.

7. a) What are Geosynthetics? Explain application of geosynthetics. **6**

b) Explain vibroflotation technique. **7**

OR

8. a) Explain ground improvement using sand drains method. **6**

b) Explain the basic concepts of reinforced earth. **7**

9. a) A square footing of size. 1.5m x 1.5m is located at depth of 1m below ground level. The soil properties are: $c = 22\ kN/m^2, \phi = 22^{o}\ \&\ r = 18\ kN/m^3$. Determine ultimate bearing capacity without water table effect. Also determine the change in ultimate bearing capacity if water table rises 0.5m above the foundation level. $Nc = 22.5, Nq = 10.2$ and $Nr = 8.1$ Consider General shear failure condition. **7**

b) Explain plate load test and its limitation. **6**

OR

10. a) Explain various modes of shear failures with suitable sketch. **7**

b) Calculate the diameter of circular shallow footing laid at 1.6m below ground and design to carry a safe load of 850 kN. The soil has angle of internal friction 35 and effective unit weight of soil 16.5 kN/m^3. Use FOS 2.5 Apply Terzaghis general bearing capacity equation. $Nc = 225, Na = 10 - 2$ and $Nv = 8.1$ **6**

11. a) Explain the phenomenon of negative skin friction. **7**

b) A group of 16 piles arranged in a square pattern with diameter and length of each pile as 0.30 m and 9m respectively, is used as foundation in soft clay deposit. Taking the unconfined compressive strength of clay as 140 kN/m^2. and the pile spacing as 1 m c/c, find the load capacity of the group. Assume the bearing capacity factor, Nc=9 and adhesion factor = 0.70. A factor of safety of 2.5 may be taken. **7**

OR

12. a) Discuss the various modes of classification of piles. **7**

b) A concrete pile of diameter 30cm is to be constructed in a cohesive soil of stiff consistency with unconfined compressive strength of 160/kN m^2. Determine the length of the pile to carry the safe load of 120 kN with factor of safety of 2. Assume the adhesion factor = 0.6. **7**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Geotechnical Engineering - II

P. Pages : 2 **NJR/KS/18/4461**

Time : Three Hours * 0 2 0 4 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Explain any one geophysical method of exploration and its limitations. **6**

b) Enlist various methods of borings. Explain wash boring with help of neat sketch. **7**

OR

2. a) Explain split spoon sampler and its use. **6**

b) Explain in brief SPT with its corrections. **7**

3. a) Derive an expression for the factor of safety of an infinite slope in a cohesive soil. What is critical height? **6**

b) A infinite slope is having following details:- **8**
saturated unit weight $=17.8\ \mathrm{kN/m^3}$, $c=10\,\mathrm{kN/m^2}$, $\phi=20^\circ$. Height of slope = 6m, slope angle = 15º. If water table is located at ground surface and assuming that there is a seepage through the soil, find the factor of safety of the slope.

OR

4. a) Explain Taylor's stability number. **7**

b) Explain friction circle method. **7**

5. a) Explain Culmann's graphical method. **6**

b) A retaining wall 8m high, with a smooth vertical back retains a clay backfill with $c'=15\,\mathrm{kN/m^2}$, $\phi=15^\circ$ and $y=18\,\mathrm{kN/m^3}$. Calculate the total active thrust on wall assuming that tension cracks develop to fill theoretical depth. **7**

OR

6. a) A retaining wall with a vertical back 6m high supports a cohesionless backfill of unit weight $19 \cdot 6\,kN/m^3$. The upper surface of the backfill rises at an angle of 10º with the horizontal, from the crest of the wall. The angle of internal friction is 20º. Find the total active pressure per meter length of the wall. Use Rebhann's graphical method. **7**

b) Explain: **6**
i) Active Earth Pressure ii) Earth Pressure at rest

7. a) Discus the functions and application of geosynthetics. **7**

b) Explain vibroflotation technique. **6**

OR

8. a) Explain in detail stabilization of soil. **7**

b) Discuss in brief "SAND DRAINS". **6**

9. a) The subsoil at a building site consists of medium sand with $c' = 0$, $y_{sat} = 18\,kN/m^3$, $\phi' = 25^\circ$ and water table is at ground surface. A 2.5m square footing is to be placed at 1.5m below G.L. compute net ultimate bearing capacity. What will be the net ultimate bearing capacity if water table goes down to 3m below GL? $\phi = 25^\circ$, $Nc' = 25 \cdot 1$, $N_q = 12 \cdot 7$, $N_y = 9 \cdot 7$. **8**

b) Explain Culmann's graphical method for cohesionless soil. **6**

OR

10. a) Explain: **6**
i) Local shear failure ii) General shear failure
iii) Punching shear failure

b) Determine the ultimate bearing capacity of a strip footing 1.5m wide with its base at a depth of 1m. Take:- **8**
$Y_d = 17\,kN/m$, $\phi = 38^\circ$, $c = 0$, $N_q = 60$, $N_y = 75$.

11. a) What are under reamed piles? Explain with neat sketches stages in construction of single under reamed pile. **6**

b) Explain the phenomenon of negative skin friction. **7**

OR

12. a) Discuss the various modes of classification of piles. **6**

b) A group of 9 piles arranged in a square pattern with diameter and length of each pile as 0.25m and 10m respectively, is used as a foundation in soft clay deposit. Taking the unconfined compressive strength of clay as $120\,kN/m^2$ and the pile spacing as 1m c/c, find the load capacity of the group. Assume the bearing capacity factor $N_c = 9$ and adhesion factor $= 0 \cdot 75$ A factor of safety of 2.5 may be taken. **7**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Geotechnical Engineering - II

P. Pages : 2 **NRJ/KW/17/4461**

Time : Three Hours * 0 9 6 5 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
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7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the depth of Exploration. **6**

b) What are different methods of Boring? Explain any one. **7**

OR

2. a) What are different types of soil Samplers? Explain any one. **6**

b) Compute the area ratio of a thin walled tube sampler having an internal diameter of 60mm and wall thickness of 2.25 mm. Do you recommend this samplers to obtain undisturbed samples? Why? **7**

3. a) Explain the relation for factor of safety of an infinite slope made of cohesionless soil subjected to seepage parallel to the slope. **7**

b) A slope (1.5:1) of height 8 m is to be made up of a soil whose properties are $\gamma = 17\,kN/m^3$, $c = 25\ kN/m^2$ & $\phi = 25^o$ Find factor of safety using Swedish circle method. **7**

OR

4. a) An infinite slope is having following details: **8**

i) Saturated unit weight = 17.8 kN/m^3

ii) $C = 10\,kN/m^2$ & $\phi' = 20^o$

iii) Height of slope = 6m

iv) Slope angle = 15^o

If water table is located at ground surface & assuming that there is a seepage through the soil, find the factor of safety of the slope.

b) Explain Frication Circle method. **6**

5. a) State the assumptions made in Rankine's earth pressure theory. State the merits and demerits. **7**

b) A 5m masonry retaining wall has to retain a backfill of sandy soil having unit weight of 18.2 kN/m^3 & $\phi' = 32^o$. The surface of the backfill is inclined at an angle of 10^o to the horizontal. determine the magnitude & point of application of the active thrust. **6**

OR

6. a) Explain Culmann's graphical method for cohesionless soil. **7**

b) a retaining wall has following details:
   i) Height of wall = 7m
   ii) Batter angle = 10º
   iii) Angle of wall friction = 20º
   iv) Unit wt. of soil = 16.5kN/m^3
   v) Angle of internal friction = 30º
   vi) Surcharge angle= 10º

Compute the total active thrust on a wall, use Rebhann's method.

b) What are the different cases of active earth pressure for cohesionless soils. **6**

7. a) Write short note on Applications of Geotextiles. **6**

b) What are Geosynthetics? Explain characteristics of geosynthetics in geotechnical construction. **7**

OR

8. a) Write short note on " Vibroflotation". **7**

b) What do you mean by soil improvement? Give brief description of the available methods of soil improvement. **6**

9. a) Write short note on Plate load test? **6**

b) A plate load test was conducted on a uniform deposit of sand & the following data were obtained: **8**

Pressure (kN/m^2) :	50	100	200	300	400	500	600
Settlement (mn):	1.5	2.0	4.0	7.5	12.5	20.0	40.0

Calculate ultimate bearing capacity of the soil.

OR

10. a) Explain Effect of water table on beaning capacity of soil. **7**

b) The subsoil at a building site consists of medium sand with $\gamma = 18\,\text{kN/m}^3$, $C' = 0, \phi' = 25$ & water table at the ground surface. A 2.5m square footing is to be placed at 1.5m below ground surface. Compute the safe bearing capacity of footing. What would be safe bearing pressure if the W. T. goes down at 3m, below GL? **7**

11. a) Explain Negative skin friction in pile. **6**

b) Explain various Dynamic formula to find out the load carrying of pile. **7**

OR

12. a) What is load carrying capacity of the pile? **6**

b) A square group of 12 piles was driven into soft clay. The diameter of piles were 300 mm. The length of the piles were. 10m. If C = 45 kN/m^2 & spacing is 1.2m c/c. what is the capacity of the pile group. Assume F.O.S is 2.5 and adhesion factor 0.75. **7**

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B.E. Fifth Semester (Civil Engineering) (C.B.S.)

Geotechnical Engineering - II

P. Pages : 3 **NKT/KS/17/7321**

Time : Three Hours Max. Marks : 80

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Notes :
1. All questions carry marks as indicated.
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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) What do you understand by the term disturbed and undisturbed soil samples? State clearly the significance of the following in sampling. **7**

i) Area ratio

ii) Inside clearance

iii) Outside clearance ratio

b) Enlist various methods of Boring Explain any one with neat sketch. **6**

OR

2. a) Explain any one geophysical methods of exploration & its limitations. **7**

b) Explain the procedure of standard penetration Test with diagram. Explain it's corrections. **6**

3. a) Explain types of slope failure & method of improving stability of slopes. **7**

b) Find the factor of safety of a slope of infinite extent having **7**
$C' = 30\,kN/m^2$, $\phi' = 20^\circ$, $e = 0.65$, $G = 2.7$ under the following conditions:

i) When soil is dry

ii) When the slope is submerged
The angle of slope $\alpha = 25^\circ$.

OR

4. a) Explain 'friction circle method' of slope stability analysis. **7**

b) A new canal is excavated to a depth of 6m below ground level, through a soil having the following characteristics. **7**

$c = 14\,kN/m^2$, $\phi = 10^o$, $e = 0.8$ & $G = 2.7$

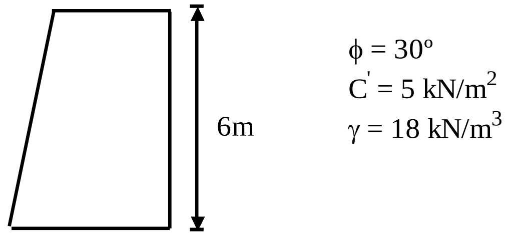
The slope of banks is 1 in 1.

calculate the factors of safety with respect to cohesion when the canal runs full. If it is suddenly and completely emptied, what will be the factor of safety? The stability number are.

i \ φ	5°	10°	15°	20°	25°
30°	0.110	0.075	0.046	0.025	0.009
45°	0.136	0.101	0.083	0.062	0.044

5. a) Explain Culman's graphical method for determining of active earth pressure. **6**

b) A 6m high retaining wall is shown in figure below. **7**



Determine the Rankine's active earth pressure on the wall at.

a) Before the formation of the crack.

b) After the formation of an crack.

OR

6. a) Explain in detail types of lateral earth pressure. **6**

b) A retaining wall 7m high supports a dry cohesionless backfill having Batter angle of 10°, angle of wall friction is 20°, unit weight of soil is $16 \cdot 5\,kN/m^2$, angle of internal friction is 30°, surcharge angle 10°. Compute the total active thrust on a wall use Rebhan's method. **7**

7. a) What do you mean by soil improvement? Give brief description of the available methods of soil improvement. **7**

b) Write notes on application of Geosynthetics in civil engineering works. **6**

OR

8. a) Explain vibroflotation method of ground improvement. **7**

b) Discuss about "Sand drain" in brief. **6**

9. a) Explain the various types of shear failure in foundation soil. **6**

b) Determine the ultimate bearing capacity of strip footing 1.5m wide with its base at a depth of 1m. Take: $r_d = 17\,kN/m^3$, $\phi' = 38^o$, $c = 0$, $N_q = 60$ $N_r = 75$. **7**

OR

10. a) Explain plate load test and its limitation. **6**

b) A square footing $1.2m \times 1.2m$ is to be founded at a depth of 1.2m below G. L. The soil properties are: $C = 20\,kN/m^2$, $\phi = 20^o$, $r = 19\,kN/m^3$, $r_{sat} = 21\,kN/m^3$. **7**

Local shear failure is expected to occur at the site. Determine:

i) The net ultimate bearing capacity without water table effect.

ii) Change in net ultimate B.C. if the water table rises 0.5m above foundation level.

The B. C. factors are.

ϕ	N_C	N_q	N_r
10	9.6	2.7	1.2
15	12.9	4.4	2.5
20	17.7	7.4	5.0
25	25.1	12.7	9.7

11. a) Enumerate different types of pile foundation. **6**

b) A group of 12 piles was driven into soft clay. The diameter and length of piles were 400mm & 9.5m respectively. If unconfined compressive strength of clay is $90\,kN/m^2$ and spacing is 900mm C/C, what is the capacity of the group. Assume F.O.S. is 2.5 and adhesion factor 0.8. **8**

OR

12. a) Explain the steps involved in computations of consolidation settlement of a pile group. **6**

b) In a two layered cohesive soil bored piles of diameter 350mm are installed. The top layer has a thickness of 4m and the bottom layer is of considerable depth. The shear strength of the top layer is $50\,kN/m^2$ & that of bottom $100\,kN/m^2$. Determine the length of the pile required to carry a safe load of 500kN allowing a factor of safety of 2.5. Assume $\alpha = 0.5$. **8**

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B.E. (Civil Engineering) Semester Fifth (C.B.S.)

Geotechnical Engineering - II

P. Pages : 2 **KNT/KW/16/7321**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
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5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain methods of boring? **6**

b) Explain types of soil samples and samplers. **7**

OR

2. a) The following dimensions are given for a shelby tube sampler:- **6**
External diameter = 55 mm
Internal diameter = 51 mm.
Determine the area ratio.

b) Explain any one geophysical method. **7**

3. a) Explain different types of slope failures. **6**

b) A infinite slope is having following details: Saturated unit weight = 18 kN/m^3, C' = $10kN/m^2$, ϕ = 22º, height of slope = 7m, slope angle = 15º. If the water table is located at ground surfaces & assuming that there is a seepage through the soil, find the factor of safety of the slope. **8**

OR

4. a) Explain friction circle method. **7**

b) Explain in detail about method of improving stability of slopes. **7**

5. a) State the assumptions made in Rankine's earths pressure theory. **6**

b) A retaining wall 5m high with vertical back supports a backfill with a horizontal surface. The unit weight of soil is $19kN/m^3$ & angle of internal friction is 30º. The angle of wall friction is 18º. A footing running parallel to the retaining wall & carrying a load of 18kN/m, is to be constructed. Find the safe distance of the footing from the face of wall. **7**

OR

6. a) Explain in brief: **6**

1) Earth at rest;
2) Active
3) Passive earth pressure.

b) Using Rebhann's method, determine the total active earth pressure on the wall with following data: 1) Ht. of wall = 7m, inclination of wall with vertical = 5º, Inclination of backfill slope with horizontal = 10º, Angle of wall friction = 20º, unit wt. of backfill = $18 kN/m^3$, Angle of shearing resistance = 30º, Cohesion = 0. **7**

7. a) Write short notes on soil Improvement. Explain applications of geosynthetic material for soil Improvement. **7**

b) Write short note on Reinforced Earth. **6**

OR

8. a) Write short note on VIBROFLOATATION. **6**

b) Explain characteristics of geosynthetics in geotechnical construction. **7**

9. a) Explain the effect of ground water table on bearing capacity. **6**

b) Determine the depth at which a circular footing of 2m diameter be founded to provide a factor of safety of 3, if it has to carry a safe load of 1500 kN. The foundation soil has $C = 10\ kN/m^2$, $\phi = 30^o$, $\gamma = 18 kN/m^3$. Use Terzaghi's analysis for $\phi = 30^o$, bearing capacity factors are $Nc = 37.2,\ Nq = 22.5,\ Ny = 19.7$ **7**

OR

10. a) State assumptions of Terzaghi's bearing capacity. **6**

b) Explain Plate load test with its limitations. **7**

11. a) Explain how piles are classified. **7**

b) Explain group actions in piles. **7**

OR

12. a) Explain negative skin friction. **7**

b) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter & length of the piles were 300 mm & 9m respectively. If unconfined compressive strength of the clay is 90 kN/m^2 & the spacing is 900 mm c/c, what is the capacity of the group? Assume fos is equal to 2.5 and adhesion factor is equal to 0.75. **7**

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B.E. (Civil Engineering) Fifth Semester (C.B.S.)

Geotechnical Engineering - II

P. Pages : 2 **TKN/KS/16/7409**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain in brief the following. **6**

i) Area ratio, ii) Inside clearance iii) Outside clearance.

b) What are geophysical methods? Explain any one method with its limitations. **7**

OR

2. a) Explain the factors governing the depth of sub-surface exploration for construction projects. **7**

b) Explain in detail standard penetration test. **6**

3. An embankment is to be made of sandy clay has $\gamma = 18\,kN/m^3$, $c = 30\,kN/m^2$ & $\phi = 20^o$. The slope and height of the embankment are 1.6:1 and 10m respectively. Find factor of safety using method of slices. Assume $\alpha_a = 20^o$ and $\alpha_b = 35^o$. **14**

OR

4. a) Explain friction circle method with a neat sketch. **6**

b) Explain types & causes of slope failure. **8**

5. a) Explain the following:- **6**

i) Earth pressure at rest. ii) Active earth pressure & iii) Passive earth pressure

b) The backfill of a 5m high retaining wall is having following properties : Angle of internal friction = 30°, Cohesion $= 10\,kN/m^2$, unit weight $= 17.5\,kN/m^2$. Determine the unsupported length & calculate active earth pressure on the wall. **7**

OR

6. a) A two layer cohesive horizontal backfill is supported by a 10 m high vertical smooth wall. Determine the Rankine's active force per unit length of the wall before & after tension crack develop in the top layer. The details of the soil properties are given below: **8**

Properties	Top layer	Bottom layer
Depth	0 – 5m	5 – 10 m
Cohesion	$12\,kN/m^2$	$35\,kN/m^2$
Angle of internal friction	0°	10°
Unit weight	$17\,kN/m^3$	$18\,kN/m^3$

b) Derive equation for unsupported length from Rankine's theory of earth pressures. **5**

7. a) Explain ground improvement using sand drains. **6**

b) Write short notes on functions and applications of Geosynthetics. **7**

OR

8. a) Write short note on 'Preloading'. **7**

b) Write a short note on geosynthetics. **6**

9. a) Explain various modes of shear failures with suitable sketch. **6**

b) A square footing of size 1.3m x 1.3m is located at depth of 1m below ground level. The soil properties are : $c = 22\ kN/m^2$, $\phi = 22^\circ$ & $\gamma = 18\, kN/m^3$. Determine ultimate bearing capacity without water table effect. Also determine the change in ultimate bearing capacity if water table rises 0.5m above the foundation level. $N_c = 22.5$, $N_q = 10.2$ and $N_\gamma = 8.1$ Consider General shear failure condition. **8**

OR

10. a) Explain the procedure of plate load test with assumption and limitations. **7**

b) Plate load test was conducted with 300mm square plate at a depth of 3m from ground level on dry sand. Find **7**

i) Ultimate bearing capacity of soil.
ii) Safe bearing capacity of soil.
iii) Width of square footing to carry a safe load of 2000 kN. Assume factor of safety is 3. The plate load test data is given in Table below:

Applied pressure (kN/m^2)	50	100	150	200	250	275	300	325	350
Settlement (mm)	3	5	9.8	13	19	22	28	39	65

11. a) A concrete pile of diameter 200mm is to be constructed in a cohesive soil of stiff consistency with unconfined compressive strength of $180\, kN/m^2$. Determine the length of pile to carry a safe load of 100 kN with a factor of safety of 2. Assume adhesion factor is 0.5 and $N_c = 9$. **7**

b) Write short notes on efficiency of pile groups. **6**

OR

12. a) Write short notes on negative skin friction in piles. **6**

b) Explain under-reamed pile foundation. **7**

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Fifth Semester B. E. (Civil) Examination

GEOTECHNICAL ENGINEERING – II

Time : Three Hours] [Max. Marks : 80

N. B. : (1) All questions carry marks as indicated.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) Explain the lateral extent and depth of exploration is decided for Different structure ? 7

   (b) Write short note on :—
   (i) Objectives of field exploration.
   (ii) Types of samples. 6

OR

2. (a) Explain electrical resistivity method of soil exploration and its limitations. 8

   (b) Enlist the type of sampler, explain thin wall sampler with its suitability. 5

3. (a) Explain the FELLINIOUS method for locating critical slip circle. 3

   (b) Determine the FOS of an embankment by method of slices. If the slope is (1.5 : 1) (H:V) and the height is 12 m. The value of C and ϕ are 40 kN/m^2 and 25^0 resp. and γ = 19 kN/m^3. Assume α = 26^0 and β = 35^0 . 10

OR

4. (a) Determine the FOS with respect to shear strength of a slope 10 m high and having an inclination

of 40^0 of soil with cohesion = 30 kN/m^2, $\phi = 10^0$ and $\gamma = 19\ kN/m^3$. 4

(b) Explain stability number. 3

(c) Derive the relation for factor of safety of an infinite slope made of cohesion less soil subjected to seepage parallel to the slope. 6

5. (a) What is the use of weep holes in retaining wall ? 4

(b) A retaining wall 6 m high has a smooth vertical back. The backfill has a horizontal surface in level with the top of the wall. The unit weight of the backfill is 20 kN/m^3. Its angle of shearing resistance is 35^0, an angle of wall friction 10^0. The line load of 100 kN is acting at 3m distance from the face of wall, Determine the magnitude and point of application of active pressure per meter length of the wall by Culmann's Graphical method. 10

OR

6. (a) A two layer cohesive horizontal backfill is supported by a 10 m high Vertical smooth wall. Determine the Rankine active force per meter Length of the wall before and after tensile crack occur in top layer. Also determine the line of action of resultant in both cases.

The details of soil layer are given below :—

0 – 5 m Top layer

$C_1 = 12\ km/m^2$

$\Phi_1 = 0^0$

$\gamma_1 = 19\ km/m^3$.

5–10 m Bottom layer

$C_2 = 32\ kN/m^2$

$\Phi_2 = 10^0$

$\gamma_2 = 20\ kN/m^3$. 8

(b) Explain :—

(1) Active Earth Pressure,

(2 Passive Earth Pressure,

(3) Earth Pressure at rest. 6

7. (a) Explain the term stabilization using admixtures, also explain any one. 6

(b) Explain the vibraflotation method for ground improvement. 7

OR

8. (a) Explain with suitable sketch, sand drain and their uses. 6

(b) Explain geosynthetic materials and its application in Civil Engineering. 7

9. (a) Discuss the various modes of shear failure of a shallow foundation. 6

(b) A square footing 1.3 m x 1.3 m is to be founded at a depth 1.2 m below G. L. The soil properties are :—

$C = 20\ kN/m^2$, $\phi = 22^0$, $\gamma = 18\ kN/m^3$, $\gamma_{sat} = 20\ kN/m^3$

Local shear failure is expected to occur at the site. Determine :—

(i) Net ultimate B.C. without water table effect.

(ii) Change in the net ultimate B.C. if the water table rises 0.5 m above foundation level.

The Bearing capacity factors are :—

ϕ	Nc	Nq	Nγ
10	9.6	2.7	1.2
15	12.9	4.4	2.5
20	17.7	7.4	5.0
25	25.1	12.7	9.7
30	37.2	22.5	19.7

8

OR

10. (a) A square footing is located at a depth of 1.3 m below the ground has to carry a safe load of 800 kN. Find the size of footing if the desired factor of safety is 3. The soil has the following properties : Void ratio = 0.55, Degree of saturation = 50%, specific gravity = 2.67, C = 8 kN/m^2, $\theta = 30^0$. 6

(b) Explain plate load test with its limitations. 8

11. (a) Write short note on :—

(i) Group efficiency of pile.

(ii) Under reamed pile foundation. 7

(b) 400 mm diameter, 8 m long pile are used for foundation a uniform deposit of medium clay having qu = 100 kN/m^2. The spacing between piles is 750 mm. There are 16 piles in a square pattern. Calculate ultimate pile load capacity of group and its group efficiency. Assume adhesion factor as 0.9. 6

OR

12 (a) A concrete pile 40 cm X 40 cm section and 20 m long is driven by drop hammer having a weight of 40 kN and falling through a height of 1.2 m. The average penetration under last 10 blows equal to 6 mm per blow. The efficiency of hammer = 100%, the coefficient of restitution is 0.4, the total elastic compression 25 mm. Using Hilley's formula determine :—

Ultimate load on pile (Q_f). 5

(b) Explain pile load test. 5

(c) Explain Negative skin friction. 3