

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/m² and 25° resp. and $\gamma = 19$ kN/m³. Assume $\alpha = 26^\circ$ and $\beta = 35^\circ$. 10

OR

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

Contd.

- of 40° of soil with cohesion = 30 kN/m^2 ,
 $\phi = 10^\circ$ and $\gamma = 19 \text{ kN/m}^3$. 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° , an angle of wall friction 10° . 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
 $C_1 = 12 \text{ km/m}^2$
 $\Phi_1 = 0^\circ$
 $\gamma_1 = 19 \text{ km/m}^3$.
- 5–10 m Bottom layer
 $C_2 = 32 \text{ kN/m}^2$
 $\Phi_2 = 10^\circ$
 $\gamma_2 = 20 \text{ kN/m}^3$. 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 vibroflotation 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 × 1.3 m is to be founded at a depth 1.2 m below G. L. The soil properties are :—

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

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	N_c	N_q	N_γ
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



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, $C = 8 \text{ kN/m}^2$, $\theta = 30^\circ$. 6
- (b) Explain plate load test with its limitations. 8
11. (a) Write short note on :—
- (i) Group efficiency of pile. 7
- (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 $q_u = 100 \text{ kN/m}^2$. 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