

16116(D)

**B. Tech 5th Semester Examination  
Geotechnical Engineering-II (NS)**

**CE-313**

**Time : 3 Hours**

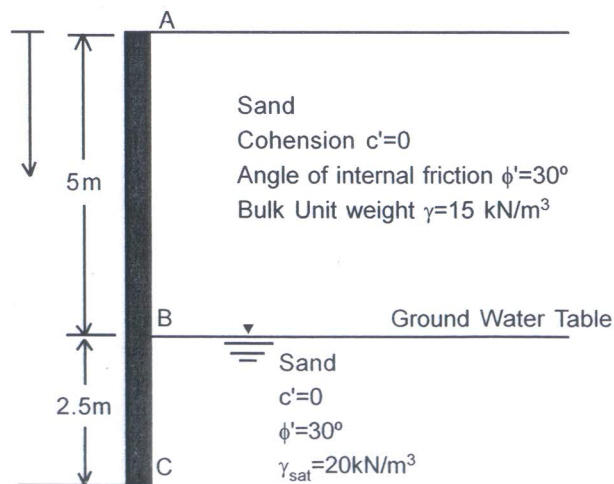
**Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

**Note :** Attempt five questions. Sections A, B, C, and D have two questions, attempt one from each section. Attempt all parts of the question in Section E. Beside each question its full mark is indicated in the parenthesis.

**SECTION - A**

- Differentiate between active and passive earth pressure on retaining wall and derive the expression for coefficient of Rankine's active earth pressure in terms of angle of internal friction for horizontal backfill. (10)
  - Figure below shows the retaining wall. Calculate the resultant Rankine's active earth pressure on per unit length of the wall and find its location. (10)

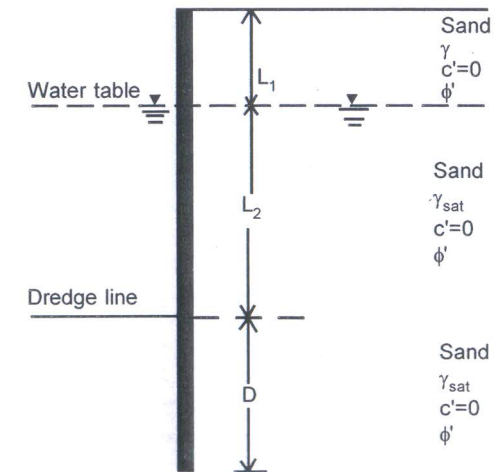


OR

- Determine the height of a finite slope (1 vertical to 2 horizontal) that should have a factor of safety of 2 against sliding. For the soil, the following values are given:  $c'=18 \text{ kN/m}^2$ ,  $\phi'=20^\circ$  and  $\rho = 1700 \text{ kg/m}^3$ . Assume the critical surface for sliding to be a plane. (10)
  - Discuss the effect on stability of an earth dam due to reservoir drawdown condition, steady seepage condition and end of construction condition. (10)

**SECTION - B**

- Figure below shows a cantilever sheet pile wall penetrating into granular soil. Given that  $L_1 = 4 \text{ m}$ ,  $L_2 = 8 \text{ m}$ ,  $\gamma = 16.1 \text{ kN/m}^2$ ,  $\gamma_{\text{sat}} = 18.2 \text{ kN/m}^2$  and  $\phi' = 32^\circ$ .
  - What is the theoretical depth of embedment  $D$ ?
  - For a 30% increase in  $D$ , what should be total length of the sheet pile? (20)



[P.T.O.]

OR

4. Describe the types of foundations with neat sketches. Also discuss their suitability with respect to its location, soil type, loading condition and settlement behaviour. (20)

**SECTION - C**

5. (a) Describe local and general shear failure of soil. (10)
- (b) A load of 400 kN/m is carried by a strip footing, 2 m wide, located at a depth of 1.5 m in a clay soil with  $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$ . Water table is quite close to the ground surface. Determine the factor of safety with respect to shear failure (i) when  $c_u = 100 \text{ kN/m}^2$  and  $\phi_u = 0$  and (ii) when  $c' = 15 \text{ kN/m}^2$  and  $\phi' = 25^\circ$ . For  $\phi_u = 0$ ;  $N_c = 5.7$ ,  $N_q = 1.0$  and  $N_\gamma = 0.0$  and for  $\phi' = 25^\circ$ ;  $N_c = 20.7$ ,  $N_q = 10.7$  and  $N_\gamma = 10.9$ . Use Tezaghi theory. (10)

OR

6. (a) Describe the different criteria on which pile foundation may be classified. Discuss the classification of pile by the effect of installation of pile on the soil. (10)
- (b) A precast pile is driven with drop hammer weighing 50 kN with a fall of 1.5 m. The average penetration of the last blows is 5 mm/blow. Determine the load carrying capacity of the pile using Engineering News formula. (10)

**SECTION - D**

7. (a) Describe all the components of a well foundation and show them in a neat sketch. (10)
- (b) What are the requirements that influence the depth of well foundation? Discuss these factors in detail. (10)

OR

8. (a) Define the degree of freedom of a block foundation and discuss the degrees of freedom of a block foundation. (10)
- (b) The resonance of a block foundation, excited by an oscillator was noted at 20 cps. The amplitude of vibration at resonance was 1.0 mm. The dynamic force magnitude of the oscillator at 20 cps was 5.0 kN. If the total weight of block and oscillator is 20 kN, calculate the damping factor associated with the system. (10)

**SECTION - E**

9. Answer all the questions:

- (i) What is the value of coefficient of earth pressure at rest ( $K_0$ ) for normally consolidated clay with  $\phi' = 38^\circ$ ?
- (ii) Define various factors of safety in the analysis of stability of slopes.
- (iii) Differentiate between anchored sheet pile walls with free earth support and fixed earth support.
- (iv) Name four types of foundations of structures.
- (v) Define safe bearing capacity and allowable bearing capacity.
- (vi) What is negative skin friction?
- (vii) What consideration governs the depth of a well foundation?
- (viii) Define (a) natural frequency (b) resonance.
- (ix) Draw neat sketch of reinforced earth wall and show its components.
- (x) Give the stability checks made for the design of reinforced earth wall. (10×2=20)