TE-sem-VI -CBSGS - Civil

GE-II

21/11/17

Q. P. Code: 13807

(3 Hours) Max Marks=80

Notes:

(a) Q. No. 1 is compulsory. Answer any 3 of the remaining questions.

(b) Assume suitable data, wherever necessary.

1. Answer any 4.

(a) Determine the factor of safety with respect to cohesion for a submerged embankment 20 m high and having a slope of 60^0. The properties of soil are $\varphi = 20^0$, $c = 40$ kN/m^2 and $\Upsilon_{sat} = 19$ kN/m^3. Taylor's stability number Sn = 0.097. 5

(b) Compare Rankine's theory of lateral earth pressure to Coulomb's theory of lateral earth pressure. 5

(c) Find the safe bearing capacity for a circular foundation of diameter 2.5 m rested at a depth of 2.0 m below the ground level in a soil having $c = 8$ kN/m^2 and $\Upsilon = 19$ kN/m^3 using Terzaghi's method. Take F.O.S. = 3, $N_c = 37.2$, $N_q = 22.5$ and $N_\Upsilon = 19.7$. 5

(d) What are the conditions where a pile foundation is more suitable than a shallow foundation? 5

(e) With the help of neat sketches, explain projection condition and ditch condition. 5

2. (a) A 10 m high cut has been made at an angle of 38^0 to the horizontal. A possible circular failure surface has a radius of 22 m and is passing through the toe of the cut slope and through a point 5 m away on the top ground from the edge of the cut. The weight of the failure mass is 1500 kN and its centre of gravity is at a distance 10 m from the centre of the failure circle. The properties of soil are $c = 40$ kN/m^2, $\varphi = 18^0$ and $\Upsilon = 20$ kN/m^3. Determine factor of safety that would be available on the said failure surface for the cut. Use friction circle method. 10

(b) Determine the active earth pressure on the retaining wall shown in Fig. 1. Take $\Upsilon_w = 10$ kN/m^3. 10

Turn Over

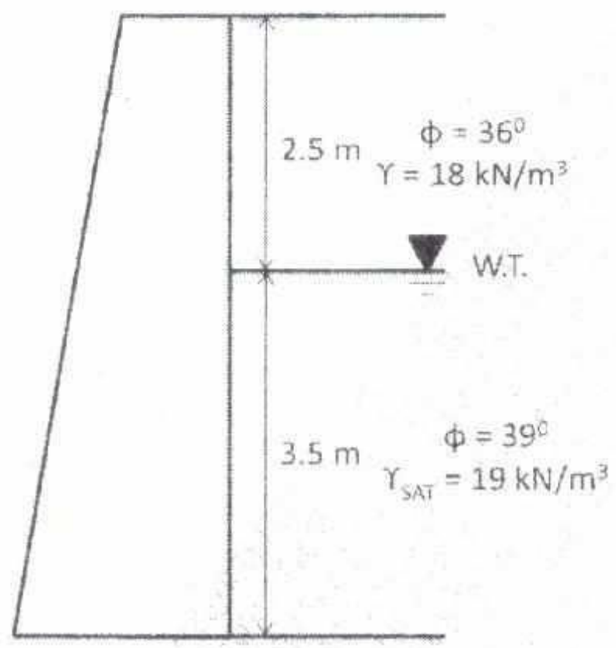

Fig. 1.

3. (a) With the help of neat sketch, explain Culmann's Graphical Method in detail. How can this method be extended to include the effect of uniform surcharge or live load applied to the backfill? 10

(b) Check the stability of the cantilever retaining wall shown in Fig. 2. The allowable bearing capacity of the soil is 500 kN/m^2. Other properties of the soil are as follows: $\phi = 36^0$, $\Upsilon = 18$ kN/m^3 and $\delta = 25^0$. 10

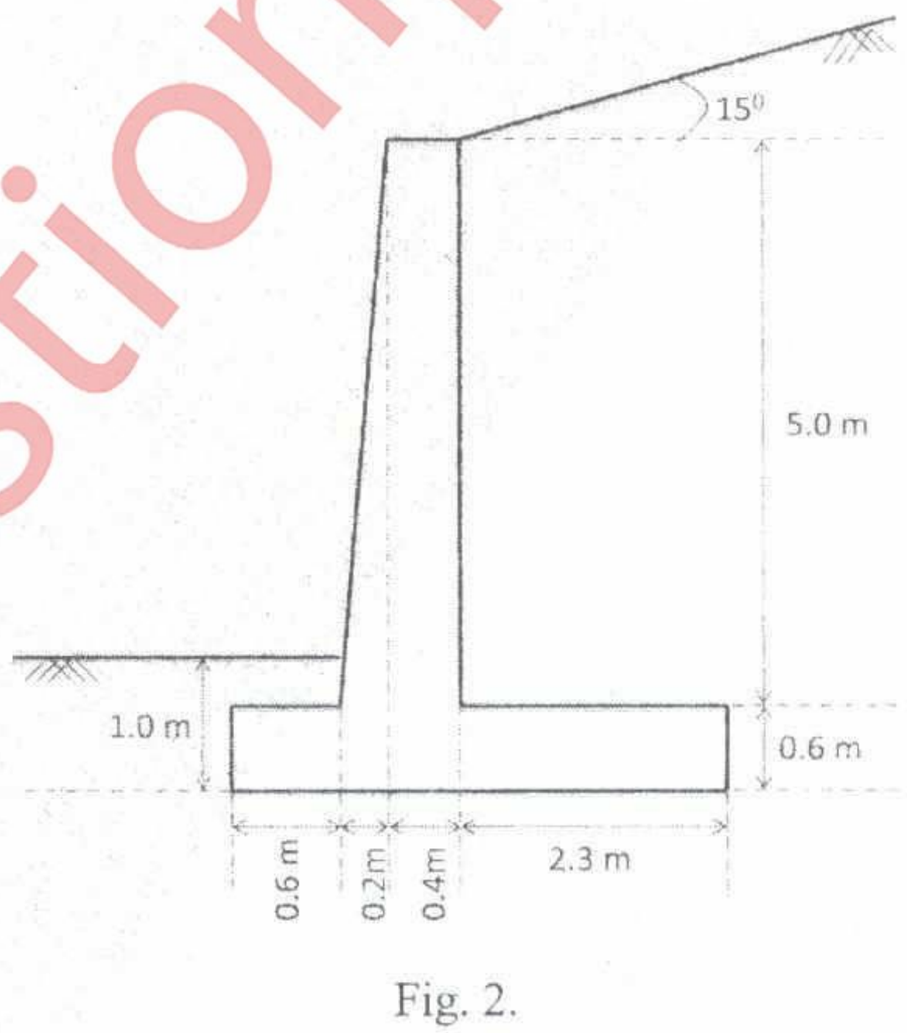

Fig. 2.

4. (a) A chimney with a rigid base 2.5 m square footing is placed at a depth of 1.2 m below the ground level. The soil is clay with c = 30 kN/m^2 and unit weight of 19.7 kN/m^3. The weight of the chimney is 100 kN and it has a resultant wind load of 25 kN acting at a height of 1.2 m above the ground level acting parallel to both of the sides. Determine the factor of safety with respect to bearing capacity using Vesic's theory. 08

(b) What are the limitations of plate load test? 06

(c) Explain in detail the effect of water table on ultimate bearing capacity of shallow foundations. 06

5. (a) A pile of 450 mm diameter and 10.5 m length is driven in a deposit having deposit having c = 0, $\phi = 30^0$, Υ = 16.5 kN/m^3 and Υ_{sat} = 18.5 kN/m^3. Considering critical depth to be 15 times the diameter of the pile, N_q = 35, k = 3.2 and $\delta = 20^0$, calculate the safe load that the pile can carry if the water table is located at a depth of 2.5 m from the ground level. Assume FOS = 2. 10

(b) An open cut 12 m deep is to be supported by 3 struts located at depths 1 m, 4 m and 9 m from the top of the cut in a soil whose profile from the top of the cut is as follows: 0 m to 2 m: c = 10 kN/m^2, Υ = 17 kN/m^3; 2 m to 5 m: c = 30 kN/m^2, Υ = 19 kN/m^3 and 5 m to 12 m: c = 50 kN/m^2, Υ = 20 kN/m^3. Find the forces in the struts if their centre to centre spacing along the length of the cut is 2.5 m. 10

6. (a) Write a short note on imperfect ditch conduit. 5

(b) What are the advantages of reinforced earth structures? 5

(c) With the help of a neat sketch, explain in detail the design considerations for mechanically stabilized earth structures. 10
