G—2015     **PMM/KS/15/7039**

## Faculty of Engineering & Technology

## Fifth Semester B.E. (Civil Engg.) (C.B.S.) Examination

## GEOTECHNICAL ENGINEERING—II

Time : Three Hours]     [Maximum Marks : 80

### INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

1. (a) Explain any one Geophysical method of exploration and its limitations.     7

    (b) What are the design features affecting the sample disturbance ?     6

### OR

2. (a) Enlist various methods of Boring. Explain any with a neat sketch.     7

    (b) Explain in brief sub-soil investigation report. 6

3. (a) An excavation is made with a verticle face in a clay soil which has $C_u = 50$ kN/m², $v = 18$ kN/m³. Determine the maximum depth of excavation so that excavation is stable. (Refer Fig. No. 1) 7
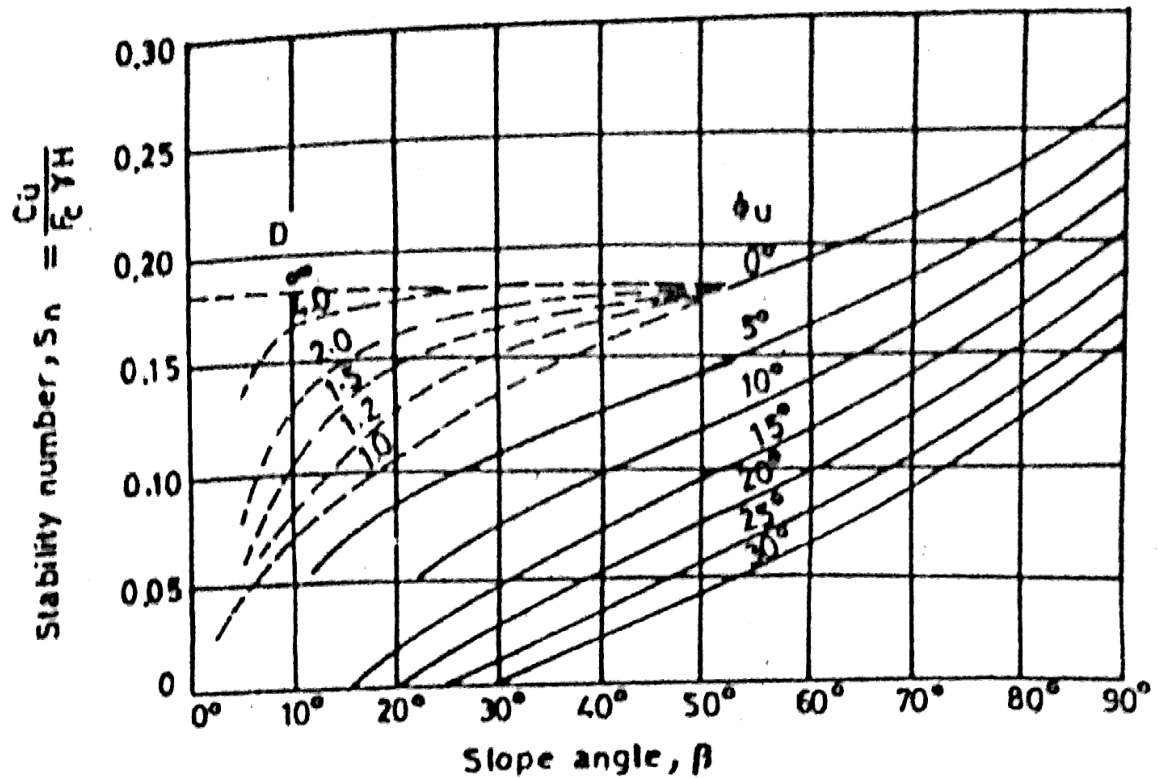


**Fig. No. 1**

(b) Explain Friction Circle method of Slope stability analysis. 7

**OR**

4. (a) Explain types and causes of slope failures. 8

(b) A new canal is excavated to a depth of 5 m below ground level, through a soil having the following characteristics $C = 14$ kN/m², $\phi = 15°$, $e = 0.8$ and $G = 2.70$. The slope of banks is 1 in 1. Calculate the factor 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 ? (Refer Table No. 1)   6

| $\phi \rightarrow$ / $i \downarrow$ | 0° | 5° | 10° | 15° | 20° | 25° |
|---|---|---|---|---|---|---|
| 90° | 0.261 | 0.239 | 0.218 | 0.199 | 0.182 | 0.166 |
| 75° | 0.219 | 0.195 | 0.173 | 0.152 | 0.134 | 0.117 |
| 60° | 0.191 | 0.162 | 0.138 | 0.116 | 0.097 | 0.079 |
| 45° | 0.170 | 0.136 | 0.108 | 0.083 | 0.062 | 0.044 |
| 30° | 0.156 | 0.110 | 0.075 | 0.046 | 0.0625 | 0.009 |
| 15° | 0.145 | 0.068 | 0.023 | — | — | — |

**Table No. 1**

5. (a) Explain the terms :

    (i) Active earth pressure,

    (ii) Passive earth pressure and

    (iii) Earth pressure at rest.   6

(b) A retaining wall of height 15 m retains a 3 layered backfill as shown in Fig. 2 with smooth vertical back. Draw active earth pressure distribution.   7

| | Layer | $v$ (kN/m³) | $c$ kN/m² | $\phi$ |
|---|---|---|---|---|
| $H_1 = 5$ m | 1 | 20 | 0 | 35 |
| $H_2 = 5$ m | 2 | 18 | 20 | 25 |
| $H_3 = 5$ m | 3 | 16 | 35 | 0 |

**Fig. No.2**

**OR**

6. (a) Explain Culmann's graphical method for determination of active earth pressure. 7

(b) State the assumptions and limitations of Rankine's earth pressure theory. 6

7. (a) Discuss the various functions and applications of Geosynthetics. 7

(b) Explain Vibrofloatation method of ground improvement. 6

**OR**

8. (a) Define soil stabilisation ? Enlist various methods of soil stabilisation and explain cement stabilisation in detail. 8

(b) Write short note on preloading with sand drains. 5

9. (a) Discuss the various types of shear failure in foundation soil. 7

(b) A square footing 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 :

e = 0.55, Degree of saturation = 50%, Specific gravity = 2.67, C = 8 kN/m², $\phi$ = 30°. Use Terzaghi Analysis.

(Take $N_c$ = 37.2, $N_q$ = 22.5 and $N_v$ = 19.7). 7

**OR**

10. (a) Explain plate load test and its limitations.  6

   (b) Explain SPT and how bearing capacity is determined from N valve.
   8

11. (a) Explain pile load test.
   6

   (b) A ground of 16 piles of 600 mm diameter is arranged in a square pattern with centre to centre spacing of 1.2 m. The piles are 10 m long and are embedded in soft clay with cohesion of 30 $kN/m^2$. Bearing resistance may be neglected for the piles. Adhesion factor is 0.6. Determine the ultimate load capacity of the pile group.  7

## OR

12. (a) A reinforced concrete pile weighing 30 kN (inclusive of helmet and dolly) is driven by a deep hammer weighing 40 kN and having an effective fall of 0.8 m. The average set per blow is 1.4 cm. The total temporary elastic compression is 1.8 cm. Assuming the coefficient of restitution as 0.25 and a factor of safety of 2, determine the ultimate bearing capacity and the allowable load for the pile.
   5

   (b) Write short notes on :

   (i) Negative skin friction

   (ii) Efficiency of pile groups.
   8