# CBCS SCHEME

USN

## Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
## Applied Geotechnical Engineering

Time: 3 hrs.                                                                 Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

**1**  a.  List and explain various objectives of soil exploration. **(06 Marks)**
   b.  Explain 4 stages of subsoil-explorations. **(08 Marks)**
   c.  Explain undistributed, distributed and representative soil samples. **(06 Marks)**

### OR

**2**  a.  A soil sample has the following dimensions:
   - Inside diameter of cutting edge = 69 mm
   - Outside diameter of cutting edge = 73 mm
   - Inside diameter of sampling tube = 70 mm
   - Outside diameter of sampling tube = 72 mm

   Compute inside clearance, outside clearance and area ratio. **(06 Marks)**

   b.  In a seismic survey, the following readings were obtained:

   | Time (sec) | 0.1 | 0.2 | 0.3 | 0.4 | 0.45 | 0.50 | 0.55 |
   |---|---|---|---|---|---|---|---|
   | Distance (m) | 40 | 80 | 120 | 160 | 200 | 240 | 280 |

   Geophones are placed at a spacing of 40m in a straight line and the time taken for the last wave to be received at each geophone is given. What is the velocity of wave in soil layers? What is the thickness of the top stratum? **(08 Marks)**

   c.  Explain Hvorslev's method to determine ground water table. **(06 Marks)**

### Module-2

**3**  a.  List out the assumptions made Boussinesq for deriving vertical stresses due to point load. Derive Boussinesq expression for vertical stress. **(08 Marks)**
   b.  Explain Isobar diagram and Influence diagrams. **(06 Marks)**
   c.  A point load of 2000 kN is applied at the ground surface. Determine the vertical stress at a point 'P' which is 6 m directly below the load. Also calculate the vertical stress at a point 'R' which is at a depth of 6m but at a horizontal distance of 5m form the axis of the load.
   **(06 Marks)**

### OR

**4**  a.  Explain types of settlements. **(06 Marks)**
   b.  A rectangular footing (3m × 2m) exerts a pressure of 100 kN/m$^2$ on a cohesive soil ($E_s = 5 \times 10^4$ kN/m$^2$, $\mu = 0.50$ I for flexible and rigid footing are 1.36 and 1.06 respectively). Determine the immediate settlement at the centre assuming (i) the footing is flexible (ii) footing is rigid. **(04 Marks)**
   c.  A square footing (2.5m × 2.5m) is resting on a sand deposit. The pressure at the level of the foundation ($\bar{q}$) is 200 kN/m$^2$. Depth of foundation is 1.5m. Variation of elastic modulus is [1m – 0.8×10$^4$ , 2m – 0.9×10$^4$ , 3m – 1×10$^4$ , 4m – 1.1×10$^4$ , 5m – 1.23×10$^4$] kN/m$^2$. Influence factor at [0m – 0.1, 1m – 0.42, 1.25m – 0.50, 2m – 0.4, 3m – 0.267, 4m – 0.133, 5m – 0]. Determine the settlement of the foundation after 6 years of construction. **(10 Marks)**

## Module-3

5 a. Explain with neat sketch At-rest, Active and Passive earth pressure. **(08 Marks)**
   b. Explain step by step procedure of Culmann's graphical construction for determination of active pressure. **(06 Marks)**
   c. Compute the intensities of active and passive earth pressure at depth of 8 meters in dry cohesionless sand with an angle of internal friction of 30° and unit weight of 18 kN/m$^3$. What will be the intensities of active and passive earth pressure if the water level rises to the ground level? Take saturated unit weight of sand as 22 kN/m$^3$. **(06 Marks)**

### OR

6 a. Explain stability of slopes and discuss on assumptions made in the analysis of stability of slopes. **(06 Marks)**
   b. Explain Swedish slip circle method for stability analysis of slopes. **(08 Marks)**
   c. Explain Fellineous method for location of critical slip circle. **(06 Marks)**

## Module-4

7 a. Explain types of shallow foundation. **(10 Marks)**
   b. List the assumptions made in Terzaghi's bearing capacity theory and derive Terzaghi's bearing capacity equation. **(10 Marks)**

### OR

8 a. Explain types of shear failure with sketches. **(06 Marks)**
   b. Determine the ultimate bearing capacity of a strip footing, 1.20m wide and having the depth of foundation 1.0m. Use Terzaghi's theory and assume general shear failure. Take $\phi' = 35°$, $\gamma = 18$ kN/m$^3$ and C' = 15 kN/m$^2$, $N_c = 57.8$, $N_q = 41.4$ and $N\gamma = 42.4$. **(04 Marks)**
   c. Explain Plate load test. Discuss on limitations of the plate load test. **(10 Marks)**

## Module-5

9 a. Explain classification of piles based on mode of transfer of load. **(06 Marks)**
   b. With the help of neat sketch explain negative skin friction. **(06 Marks)**
   c. A pile group consisting of 12 piles (4×3) is subjected to a total load of 4 MN with eccentricity $e_x = 0.3$m, $e_y = 0.4$m. Distance between the piles is 1m. Determine the maximum load in an individual pile. **(08 Marks)**

### OR

10 Write short notes on following :
   a. Efficiency of pile group
   b. Group capacity of piles
   c. Settlement of piles
   d. Under reamed piles
   e. Pile load tests. **(20 Marks)**

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