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**Fifth Semester B.E. Degree Examination, Dec. = ' - an.2020**  
**Applied Geotechnical Engineering**

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.*  
*2. Use of IS:6403 pernzitted.*

**Module-I**

- 1 a. What are the objectives of soil exploration? (06 Marks)
- b. With a neat sketch, explain seismic refraction method of soil exploration. (08 Marks)
- c. What is the necessity of dewatering? Explain electro-Osmosis method of dewatering. (06 Marks)

OR

- 2 a. Define the following terms with reference to a sampling tube with a neat sketch:
  - i) Inside clearance
  - ii) Outside clearance
  - iii) Area ratio
  - iv) Recovery ratio. (08 Marks)
- b. What is stabilization of bore holes? Explain any one method. (06 Marks)
- c. List and explain types of soil samples. (06 Marks)

**Module-2**

- 3 a. Derive the equation for vertical stress below the centre of a circular area with uniform load intensity 'q'. (08 Marks)
- b. Define Isobar. Construct an Isobar for a vertical stress of  $40\text{kN/m}^2$  when ground surface is subjected to a concentrated load of 1000kN. (08 Marks)
- c. Estimate the immediate settlement of a footing of size 2m x 3m resting at a depth of 2m in a sandy soil whose compression modulus is  $1\text{ ON/mm}^2$  and the footing is expected to transmit a unit pressure of  $160\text{kN/m}^2$ . Assume  $I_A = 0.28$  and  $I_f = 1.06$ . (04 Marks)

OR

- 4 a. Explain the construction and use of Newmark's chart. (08 Marks)
- b. Explain contact pressure distribution in soils. (06 Marks)
- c. A square footing 1.2m x 1.2m rests on a saturated clay layer 4m deep. The soil properties are  $W_L = 30\%$ ,  $w_{sat} = 17.8\text{kN/m}^3$ ,  $w = 28\%$  and  $G = 2.68$ . Determine primary consolidation settlement if the footing carries a load of 300kN. (06 Marks)

**Module-3**

- 5 a. Define with neat sketches at rest, active and passive earth pressures. (06 Marks)
- b. Explain Culmann's graphical method of finding out the active earth pressure. (06 Marks)
- c. A retaining wall retains a cohesionless backfill with a height of 7.5m. The top 3m of the backfill has unit weight of  $18\text{kN/Nm}^3$  and  $c\phi = 30^\circ$ . Lower 4.5m of the backfill has unit weight of  $24\text{kN/m}^3$  and  $(I) = 20^\circ$ . Obtain pressure distribution diagram and determine the total active pressure and its point of application. (08 Marks)

**OR**

- 6 a. Explain Fellenius method of obtaining centre of critical slip surface in the case of stability analysis of C-(1) soil. (08 Marks)
- b. Explain the causes for slope failure and also list the type of slope failures. (06 Marks)
- c. A 5m deep canal has side slopes of 1:1. The properties of soil are  $C_u = 20 \text{ kN/m}^2$ ,  $(1)_{\infty} = 10^\circ$ ,  $e = 0.80$  and  $G = 2.8$ . If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when the canal runs full. Also find the factor of safety in case of sudden draw down, if the Taylor's stability number for this condition is 0.137. (06 Marks)

**Module-4**

- 7 a. Define: Ultimate bearing capacity, net ultimate bearing capacity and safe bearing capacity. (06 Marks)
- b. Explain plate load test with a neat sketch. (08 Marks)
- e. A foundation 2.0m square is installed 1.2m below ground level in sandy soil having unit weight of  $19.2 \text{ kN/m}^3$  above water table and submerged unit weight of  $10.1 \text{ kN/m}^3$ . If  $C = 0$ , and  $(I) = 30^\circ$ , find ultimate bearing capacity when
- Water table is well below the base of the foundation,
  - Water table rises to foundation level,
  - Water table rises to ground level.
- Take  $N_g = 22$  and  $N_c = 20$ . (06 Marks)

**OR**

- 8 a. Distinguish between general shear failure and local shear failure. (06 Marks)
- b. Explain with a neat sketch the effect of ground water table and eccentricity on bearing capacity. (08 Marks)
- c. How do you conduct SPT? What are the corrections applied to observed 'N' values? (06 Marks)

**Module-5**

- 9 a. Explain classification of piles based on function. (06 Marks)
- b. Explain negative skin friction in pile foundation. (06 Marks)
- c. Design a square pile group to carry 400kN of load in clay with an unconfined compressive strength of  $60 \text{ kN/m}^2$ . The piles are 30cms diameter and 6m long. Adhesion factor may be taken as 0.6. (08 Marks)

**OR**

- 10 Write short notes on any four of the following:
- Pile load test
  - Under reamed piles
  - Settlement of piles
  - Efficiency of pile group
  - Group capacity of piles.

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(20 Marks)