



CBCS SCHEME

15CV53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed.

Module-1

- 1 a. List the methods of soil exploration. With a neat sketch explain seismic refraction method. (08 Marks)
- b. A sampling tube has inner diameters of 70mm and cutting edge diameter of 68mm. Its outside diameter are 72mm and 74mm respectively. Determine the area ratio, inside clearance and outside clearance of the sampler. This tube is pushed at the bottom of the borehole to a distance of 550mm with length of sample recorded being 530mm. Find recovery ratio. (08 Marks)

OR

- 2 a. List the methods of dewatering employed in field and with a neat sketch explain multi-stage well point system. (08 Marks)
- b. Estimate the position of the ground water table from the following data obtained from the field :
- i) Depth upto which water is bailed out = 30m
 - ii) Raise in water level on First day = 2.2m
 - iii) Raise in water level on Second day = 1.8m
 - iv) Raise in water level on Third day = 1.5m.
- (08 Marks)

Module-2

- 3 a. Compare Boussinesq's and Westergaard's analysis. Also state their limitations. (08 Marks)
- b. Find the intensity of vertical pressure and horizontal shear stress at a point 4m directly below a 20kN point load acting at a horizontal ground surface. What will be the vertical pressure and shear stress at a point 2m horizontally away from the axis of loading but at the same depth of 4m? (08 Marks)

OR

- 4 a. Explain the terms immediate settlement, consolidation settlement, secondary settlement differential settlement and uniform settlement. (10 Marks)
- b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 2m in a sandy soil whose compression modulus is 10N/mm² and the footing is expected to transmit a unit pressure of 160 kN/m². Assume $\mu = 0.28$ and $I_f = 1.06$. (06 Marks)

Module-3

- 5 a. With neat sketches explain types of earth pressure. (08 Marks)
- b. A retaining wall of 8m height retains sandy material. The properties of sand are $e = 0.6$, $\phi = 30^\circ$ and $G = 2.65$. The water table is at a depth of 2.5m from the ground surface. Draw the earth pressure diagram and determine the intensity of earth pressure at the base of the retaining wall. (08 Marks)

OR

- 6 a. List causes of slope failure and with neat sketches explain types of slope failures. (08 Marks)
 b. A 5m deep canal has side slopes of 1 : 1. The properties of soil are $C_u = 20 \text{ kN/m}^2$, $\phi_u = 10^\circ$, $e = 0.8$, 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 same in case of draw down, if the stability numbers for this condition is 0.137. (08 Marks)

Module-4

- 7 a. With a neat sketch explain standard penetration test. (08 Marks)
 b. Determine the safe bearing capacity of square footing 2.1 width placed at a depth of 1.5m in a soil with saturated unit weight of 17 kN/m^3 , $C = 15 \text{ kN/m}^2$, $\phi = 20^\circ$, $N_c = 11.8$, $N_q = 3.9$ and $N_r = 1.7$. What is the change in bearing capacity, if the water table raises to 0.5m above the base of the footing? Assume factor of safety as 3. (Take unit weight of soil as 17 kN/m^3 for all cases). (08 Marks)

OR

- 8 a. With neat sketches explain types of shallow foundations. (10 Marks)
 b. A square footing located at a depth of 1.3m below ground has to carry a safe load of 800kN. Find the size of footing if the desired factor of safety is 3. Use Terzaghi's analysis for general shear failure. Take $C = 8 \text{ KPa}$, $N_c = 37.2$, $N_q = 22.5$ and $N_r = 19.7$. (06 Marks)

Module-5

- 9 a. Explain the classification of piles based on load transfer and function. (08 Marks)
 b. In a 16 pile group, the pile diameter is 45cm and centre to centre spacing of the piles is 1.5m. If $C = 50 \text{ kN/m}^2$, determine whether the failure would occur with the pile acting individually or as a group? Neglect bearing at the tip of the pile. All piles are 10m long. Take $M = 0.7$. (08 Marks)

OR

- 10 a. With a neat sketch explain negative skin friction. (08 Marks)
 b. A pile group of 9 piles, 10m long is used as a foundation for a bridge pier. The piles used are 30cm diameter with centre to centre spacing of 0.9m. The sub soil consists of clay with unconfined compressive strength of 1.5 kg/cm^2 . Determine the efficiency neglecting bearing action. Take adhesion factor as 0.9. (08 Marks)
