

**Sixth Semester B.E. Degree Examination, July/August 2022**  
**Applied Geotechnical Engineering**

Time: 3 hrs.

Max. Marks: 100

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. What is sub-surface exploration? What are the objectives of soil exploration? (07 Marks)  
b. With a neat sketch explain seismic refraction method. (07 Marks)  
c. Determine the area ratios for the following soil sampler and comment the nature of samples obtained in each samplers  
i) Core cutter 185mm OD 135mm ID  
ii) Split Barrel 51mm OD 45mm ID  
iii) Shellby tube 51mm OD 49mm ID  
Which one you recommended to be used for getting good qualifier samples? (06 Marks)

**OR**

- 2 a. List the methods of dewatering technique used in the field and explain vacuum method. (06 Marks)  
b. List and explain different types of samples of soil. (06 Marks)  
c. Estimate the position of ground water table with following data by Hvorselve's method.  
Depth upto which water is bailed out = 10.5m.  
Water rise in 1<sup>st</sup> day = 0.63m  
2<sup>nd</sup> day = 0.57  
3<sup>rd</sup> day = 0.51m (08 Marks)

**Module-2**

- 3 a. Distinguish between Boussinesq's theory with Westergaurd's theory of stress distribution. (06 Marks)  
b. Explain contact pressure distribution of soil. (06 Marks)  
c. A circular area 6m in diameter carries uniformly distributed load of 10kN/m<sup>2</sup>. Determine the vertical stress at a depth of 2m, 4m, and 8m. Plot the variation of vertical stress with depth. (08 Marks)

**OR**

- 4 a. Explain :  
i) Pressure bulb  
ii) Pressure distribution on Horizontal plane  
iii) Pressure distribution on vertical plane. (06 Marks)  
b. What are the different types of settlements? Explain. (06 Marks)  
c. A Normally consolidated clay layer is 18m thick. Natural water content is 45%, saturated unit weight is 18kN/m<sup>3</sup> specific gravity is 2.7 and liquid limit is 63%. The vertical stress increment at centre of clay layer due to foundation load is 9kPA. Ground water table is at the surface. Determine the settlement. (08 Marks)

**Module-3**

- 5 a. With a neat sketches, explain types of earth pressure. (06 Marks)  
b. Describe Rebhann's graphical method of determining the active earth pressure on retaining wall. (08 Marks)

- c. A Retaining wall 7.5m high retains cohesionless, horizontal backfill. The top 3m of fill has a unit weight of  $18\text{kN/m}^3$  and  $\phi = 30^\circ$  and the rest has a unit weight of  $24\text{kN/m}^3$  and  $\phi = 20^\circ$ . Determine using Rankine's theory, the distribution of active earth pressure and total active earth thrust. (06 Marks)

OR

- 6 a. With neat sketches, explain different types of slope failures. (06 Marks)  
 b. Explain Swedish circle method of stability analysis of slopes for  $C - \phi$  soils. (06 Marks)  
 c. An embankment is to be constructed with  $C = 20\text{kN/m}^2$ ,  $\phi = 20^\circ$ ,  $\gamma = 18\text{kN/m}^3$ , F.S = 1.25 and height is 10m. Estimate side slope required. Taylor's stability numbers are as follows below table. Also find the factor of safety, if the slope is 1V: 2H given  $\phi = 20^\circ$ .

Slope angle	90	75	60	45	30	20	10
Sn	0.182	0.134	0.097	0.062	0.025	0.005	0

(08 Marks)

**Module-4**

- 7 a. Explain the types of shear failures with neat sketches. (06 Marks)  
 b. With the help of neat sketches, explain the effect of water table and eccentric loading on bearing capacity of soil. (08 Marks)  
 c. A square footing is to be constructed on a deep deposit of sand at a depth of 0.9m to carry a design load of 300kN with a factor of safety of 2.5. The ground water table may rise to the ground level during rainy season. Design the plan dimension of footing given  $\gamma_{\text{sat}} = 20.8\text{ kN/m}^3$ ,  $N_c = 25$ ,  $N_q = 34$  and  $N_\gamma = 32$ . (06 Marks)

OR

- 8 a. List the assumptions and limitation made in Terzaghi's analysis. (06 Marks)  
 b. With neat sketch, explain plate load test. (06 Marks)  
 c. A square footing  $2.8 \times 2.8\text{m}$  is built on a homogeneous bed of sand of density  $18\text{kN/m}^3$  and  $\phi = 36^\circ$ . If depth of foundation is 1.8m. Determine the safe load on footing. Take  $F = 2.5$ ,  $N_c = 27$ ,  $N_q = 36$ ,  $N_\gamma = 35$ . (08 Marks)

**Module-5**

- 9 a. Explain the classification of piles based on the material and function. (08 Marks)  
 b. Mention the situations where the pile foundation is necessary. (04 Marks)  
 c. In a group of 16 pile diameter is 450mm and center to center spacing of the square group 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 adhesion factor as 2 and Factor of safety 2.5. Also find safe allowable load. (08 Marks)

OR

- 10 Write a short notes on :  
 i) Group capacity of piles (05 Marks)  
 ii) Negative skin friction (05 Marks)  
 iii) Under reamed piles (05 Marks)  
 iv) Settlement of piles. (05 Marks)

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