

**(3 hours)****[Total Marks :80]**

- NB:** 1) Question **No. 1** is **Compulsory**.  
2) Attempt **any three** out of remaining **five** Questions.  
3) Assume Suitable wherever necessary.  
4) Numbers to right indicate full marks.

- 1 a) Explain the Role of Geotechnical Engineer in Civil Engineering Practices. 5  
b) Differentiate between Compaction and Consolidation. 5  
c) State the Merits and demerits of Direct shear test. 5  
d) Write Short note on Quick Sand Condition. 5
- 2 a) Derive the relationship between unit weight , dry unit weight, Moisture Content. 5  
b) A soil Sample is found to have the following Properties. Classify the soil according to I.S. Classification System. a) Passing 75micron sieve= 10% b) Passing 4.75 mm sieve= 70 %  
c) Uniformity Coefficient = 8 d) Coefficient of Curvature = 2.8 e) Plasticity Index = 4  
c) The plastic limit of a soil a soil is 25% and its Plasticity index is 8%. When the soil is dried from its state at plastic limit, the volume change is 25% of its volume at plastic limit. Similarly the corresponding volume change from the liquid limit to dry state is 34% of its Volume at Liquid limit. Determine the shrinkage limit and shrinkage ratio. 10
- 3 a) In an Earthen embankment under Construction the bulk unit weight is  $16.5 \text{ kN/m}^3$  at water content of 11%. If the water content is to be raised to 15%, compute the quantity of water required to be added per cubic meter of soil? Assume no change in the Void Ratio. 10  
b) Define following 5  
a) Porosity b) Seepage Pressure c) Pore Pressure d) Liquidity Index e) Relative Density  
c) Calculate the Horizontal and Vertical Permeabilities of Soil deposit consisting of three Layers 150 cm , 180cm and 200 cm thick with Permeabilities  $10^{-5}$ ,  $10^{-7}$  and  $10^{-9}$  m/sec respectively. 5
- 4 a) Explain the Factors affecting Compaction. 5  
b) In site reclamation project, 2.5m of Graded fill ( $\gamma = 22 \text{ kN/m}^3$ ) were laid in compacted layers over an existing layer of silty clay ( $\gamma = 18 \text{ kN/m}^3$ ) which was 3m thick. This was underlain by a 2m thick layer of gravel ( $\gamma = 20 \text{ kN/m}^3$ ) Assuming that the water table remains at the surface of the silty clay. Draw the effective stress profiles for case i) before the fill is placed and case ii) after the fill has been placed. 10

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c) Discuss Properties and application of Flow net. 5

5 a) An Undrained triaxial Compression strength test was conducted on clayey silt soils, and the following test results are obtained. 10

Specimen No.	1	2	3
$\sigma_3$ (kN/m <sup>2</sup> ) Minor Principle Stress	17	44	56
$\sigma_1$ (kN/m <sup>2</sup> ) Major Principle Stress	157	204	225
u(kN/m <sup>2</sup> ) Pore Pressure	12	20	22

Determine the shear parameters considering effective stresses.

b) Explain Mohr- Coulomb Failure theory. 5

c) List out assumption made in in Terzaghi's one dimensional consolidation theory. 5

6 a) Discuss with sketch any one boring method used in soil exploration Programme. 5

b) Find the time required for 50% consolidation in a soil of 8m thick, if coefficient of consolidation is  $1 \times 10^{-4}$  cm<sup>2</sup>/ min. 10

c) Write a note on Geosynthetics. 5

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