

- N. B.:
- (1) Question No. 1 is compulsory.
  - (2) Attempt any three from remaining five questions.
  - (3) Figures to the right indicate the full marks.
  - (4) Assume suitable data if not given and justify the same.
- Q. 1
- A. Explain the scope of geotechnical engineering in design of deep foundation. 05
  - B. Explain the advantages of compaction 05
  - C. Define the unconfined compression strength. A specimen of clay [size dia. 38 mm & height 76 mm] in undrained condition fails at axial load of 116 N under strain of 2%. Calculate the unconfined strength & undrained cohesion. 05
  - D. Explain the primary consolidation with spring analogy system. 05
- Q. 2
- A. A soil sample with a specific gravity of 2.67 was filled in a 1000 ml container in the loosest possible state and dry weight of the sample was found to be 1475 gm it was then filled at the densest state obtainable and the weight was found to be 1770 gm. The void ratio of the soil in the natural state was 0.63. Determine the density index in the natural state.  $G = 2.67$ . 10
  - B. Explain the use of plasticity chart given by IS 1498 to classify the soil. 05
  - C. Explain the static cone penetration Test. 05
- Q. 3
- A. A glass cylinder 5 cm internal diameter and with a screen at the bottom was used as a falling head permeameter. The thickness of the sample was 10 cm. With the water level in the tube at the start of the test as 50 cm above the tail water, it dropped by 10 cm in one minute, the tail water level remaining unchanged. Calculate the value of coefficient of permeability of soil. Comment on the nature of soil. 10
  - B. Explain the direct and indirect method of soil investigation. 05
  - C. Explain the phenomenon of capillary rise & its application in geotechnical engineering. 05

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- Q. 4 A. Write the characteristics of flow net. 05  
 B. Write a note on bore log, explain it with proper representation. 05
- Q. 4 C. A sand stratum 10 m thick. The water table is 2 m below ground surface. The unit weight of sand layer above and below water table are  $17 \text{ kN/m}^3$  and  $21 \text{ kN/m}^3$  respectively. The capillary rise above water table is 1 m. Draw the effective stress, pore pressure and total stress diagrams for sand stratum. 10
- Q. 5 A. Explain the phenomenon of quick sand condition & derive the formula for critical hydraulic gradient. 05  
 B. Using the following data, classify the soil. (i) Liquid limit = 40% ; Plastic limit = 22% (ii) Liquid limit = 20% ; Plastic limit = 14% 05  
 C. A triaxial compression test on a cohesive sample cylindrical in shape yields the following effective stresses. 10  
     Major principal stress.... =  $8 \text{ MN/m}^2$   
     Minor principal stress.... =  $2 \text{ MN/m}^2$   
 Angle of inclination of rupture plane is  $60^\circ$  to the horizontal. Present the above data, by means of a Mohr's circle of stress diagram. Find the angle of internal friction. 10
- Q. 6 A. Explain the scope of geotechnical engineering in analysis & design of earth retaining structures. 05  
 B. Explain the wet and dry sieve analysis. 05  
 C. Following results were obtained from a consolidation test. Initial height of sample is 2.5 cm & height of solids particles is 1.25 cm. 10

Pressure (kN/m <sup>2</sup> )	0	13	27	54	108	214	480	960	1500
DGR	0.000	0.000	0.004	0.016	0.044	0.104	0.218	0.340	0.420

Plot the pressure void ratio curve and determine the compression index & preconsolidation pressure.

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