(3 Hours)   **Marks : 80**

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.   Write the characteristics of flow net.   05

B.   Draw the plasticity chart and explain its use in classification of fine grained soil.   05

C.   Define soil mechanics, geotechnical engineering, cohesive & cohesionless soil.   05

D.   Write the use of compaction.   05

Q. 2   A.   Establish the equation with parameters γ_d, n_a, G, γ_w and w. Notations have usual   05
meaning.

B.   Explain the shrinkage ratio, volumetric shrinkage and shrinkage index.   05

C.   Derive expressions for horizontal and vertical equivalent permeability for a   10
stratified soil deposit using usual notations.

Q. 3   A.   A sample of clay with a weight of 6.7 N was coated with paraffin wax. The   10
combined weight of clay and wax was found to be 6.78 N. The volume of wax
coated sample was found by immersion in water to be 350000 mm^3. The sample
was then broken and moisture content was found to be 16%. If the G value of
soil and wax are 2.67 and 0.89 respectively, determine the bulk unit weight, void
ratio and degree of saturation of sample.

B.   For the given data classify the following soils as per IS 1498:   10

(a) Liquid limit : 41%, Plastic Limit: 21%

(b) Liquid limit : 20%, Plastic Limit: 14%

(c) Passing 4.75 mm sieve = 71%, Passing 75 μ sieve = 9%, C_u = 7,

C_c = 2.9, I_p = 3.

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Q. 4.   A.   A saturated specimen of cohesionless sand was tested in triaxial compression 10 and the sample failed at a deviator stress of 482 kN/m^2 when the cell pressure was 100 kN/m^2, under the drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand, if it is tested under cell pressure of 200 kN/m^2?

   B.   Explain the static cone penetration test.   05

   C.   Explain the procedure to compute the pre-consolidation pressure using Cassagrand's method.   05

Q. 5   A.   From a Proctor's compaction test the maximum dry density was found to be 1.75 10 gm/cc and OMC 14.5%. The specific gravity of soil grains is 2.6.
(a) Find out the Degree of Saturation and percentage air voids at the optimum state.
(b) A specimen 10 cm in diameter, 20 cm in height is to be prepared for triaxial test with same soil by static compaction to correspond to the optimum state. Find out the weights of the oven dried soil and water required for the specimen.

   B.   A layer of soft clay is 5 m thick and lies under a newly constructed building. The 10 weight of sand overlying the newly clayey layer produces a pressure of 260 kN/m^2 and the new construction increases the pressure by 100 kN/m^2. If the compression index is 0.45, compute the settlement. Water content is 40% and G = 2.65

Q. 6   A.   In a falling head permeability test, head causing flow was initially 60 cm and 05 drop 3 cm in 5 minutes. What will be the time required for the head to fall from 60 cm to 30 cm?

   B.   Explain the bore log with proper representation.   05

   C.   Explain how to determine the liquid limit using Cassagrand's apparatus.   05

   D.   Write the use of particle size distribution curve.   05

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