(**Time: 3 Hours**)   **Max Marks: 80**

NB: 1) Question No. 1 is compulsory
      2) Attempt any 3 of the remaining 5 questions
      3) Assume suitable data wherever necessary
      4) Numbers to right indicate full marks.

1. Answer any 4:
   a) Explainthe importance of field exploration in geotechnical engineering.   05
   b) Write a short note on Atterberg limits.   05
   c) What are the limitations of sedimentation analysis.   05
   d) Derive the expression for average coefficient of permeability of stratified soil deposits when the   05
      flow is parallel to the planes of stratification.
   e) Explain the factors affecting compaction?   05

2. a) Using three phase diagram, derive the expression for submerged density in terms of voids ratio.   05
   b) For the construction of an embankment, the soil is transported from the borrow area using a   10
      truck which can carry 5 m^3 soil at a time. Determinei) the volume of soil to be excavated from
      the borrow pit and ii) the number of truck loads required to obtain 100 m^3compacted earth fill
      from the following details:

Property	Borrow Area	Truck	Field
Bulk Unit Wt.	17kN/m^3	12kN/m^3	19kN/m^3
Water Content	8.5%	6.5%	14.5%

   c) Write a short note on activity of clays.   05

3. a) The mass and volume of a saturated soil sample is 30.8 gm and 18.8 cc. respectively. On oven   10
      drying, the mass got reduced to 20 gm and volume to 9.9 cc respectively. Calculate the shrinkage
      limit, shrinkage ratio, volumetric shrinkage and specific gravity of the sample.
   b) Sieve analysis was performed on 1000 gm of dry soil sample and the following observations   10
      were made:

Sieve Size (mm)	20	10	4.75	2	1	0.6	0.425	0.3	0.212	0.15	0.075
Mass Retained (gm)	33	49	85	140	160	142	118	82	56	35	23

   If the liquid limit and plasticity index of the sample is 15% and 20% respectively, classify the
   soil sample as per IS classification.

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4. a) Write a short note on relative density. 05

 b) In a falling head permeability test on a soil sample of length 100 mm, the head of water in the stand pipe takes 10 seconds to fall from 850 mm to 175 mm above the tail-water level. Then another soil of length 60 mm is placed on top of the first soil. The time taken for the head to fall between the same limit is 18 seconds. The permeameter has a cross-sectional area of 5000 mm^2 and a stand pipe area of 150 mm^2. Calculate the permeability of the 2nd soil. 10

 c) Define: i) flow line, ii) equipotential line, iii) flow net, iv) field and v) flow channel. 05

5. a) A test well 0.5 m in diameter penetrates through a saturated aquifer 10 m thick overlying an impervious layer. The steady discharge of the well is 19.72 m^3/hr. The drawdown at a distance of $R_1 = 20$ m from the centre of test well is found to be 1.9 m. What will be the drawdown at a distance of $R_2 = 50$ m, if the permeability of soil is 3.8 x 10^{-4} m/sec? Estimate approximate drawdown at the test well also. 10

 b) A sand stratum is 12 m thick. The water table is 4 m below ground level. The unit weight of sand layer above and below water table is 17.5kN/m^3 and 21 kN/m^3 respectively. The capillary rise above water table is 2m. Draw the effective stress, pore pressure and total stress diagram for the sand stratum. 10

6. a) The results of an IS Standard Proctor Test are as follows: 10

Trial No.	1	2	3	4	5	6
w (%)	9	11.1	13.9	14.3	16.3	16.7
ρ_d(gm/cc)	1.58	1.76	1.85	1.77	1.63	1.60

The specific gravity of soil particle is 2.65. Plot the following: a) moisture content - dry density curve, b) zero air voids curve and c) 10% air content curve. Determine the optimum moisture content and the corresponding maximum dry density.

 b) Explain the corrections made in standard penetration test. 05

 c) Write a short note on borehole logs. 05