Con. 8904-13.   **LJ-11447**

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.

(2) Answer **four** out of remaining **six**.

(3) Assume suitable **data** wherever **needed**.

1. (a) Attempt any **four** of the following :-   5
        Explain (i) Density index, (ii) Sensitivity, (iii) Degree of saturation, (iv) Flow
        index, (v) Consistency index.

    (b) One cubic meter of wet soil weights 19.8 KN. If the specific gravity of soil particles   5
        is 2.7 and water content is 11%, Find e, r_d, s.

    (c) Explain briefly uses of flownet.   5

    (d) Define placement water content and relative compaction.   5

    (e) Derive the expression for coefficient of permeability by variable head method.   5

    (f) Explain initial, primary and secondary consolidation.   5

2. (a) Derive the relation between r, G, e and S starting from basics.   5

    (b) A borrow material with an insitu dry unit weight of 16 KN/m³ is to be used in the   10
        construction of highway embankment. The wet unit weight of compacted soil in
        the embankment is 19.6 KN/m³ with a water content of 15%. Volume of embankment
        is 50,000 m³. Calculate the volume of borrow material required.

    (c) Enlist the assumptions made in Terzaghi's one dimensional consolidation analysis.   5

3. (a) Define stokes law and describe briefly about wet sieve analysis.   7

    (b) Briefly explain the design features of sampler for getting undisturbed sample.   6

    (c) The liquid limit of clayey soil is 56% and plasticity index is 15%.   7

        (i)   In what state of consistency this material at the water content of 45%.

        (ii) What is the plastic limit of soil.

        (iii) The void ratio of this soil if the minimum volume reached on shrinkage is
              0.88. What is the shinkage limit if its G = 2.71.

[TURN OVER

4. (a) A soil sample has W_L = 20%, W_P = 12%. **6**

Steve size	% passing
2.032 mm	100
0.422 mm	85
0.075 mm	38

Classify the soil as per IS classification system.

(b) A test well 0.5 m in diameter penetrates through a saturated aquifer 8 m thick **10** overlying an impervious layer. A steady discharge of the well is 18.72 m³/hr. The drawdown at a distance of R_1 = 15 m from the centre of test well is found to be 1.8 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/s? Estimate approximate drawdown at the test well also.

(c) Differentiate compaction and consolidation. **4**

5. (a) A granular soil deposit is 7 m deep over an impermeable layer. The ground water **7** table is 4 m below ground level. The deposit has a zone of compillary raise of 1.2 m with a saturation of 50%. Plot the variation of total stress, pore water pressure, and effective stress diagrams with e=0.6, G = 2.65.

(b) Define quick sand condition and derive the expression for critical hydraulic gradient. **6**

(c) At given location 8 m thick saturated clay W = 30%, G = 2.7 is underline by sand. **7** The sand layer is under artesian pressure equivalent to 3 m of water head. It is proposed to make an excavation in clay. How deep can this excavation be made before the bottom fails.

6. (a) The following observations were made in standard proctor test :- **6**

Trial No.	1	2	3	4	5	6
Neight of wet soil (kg)	1.7	1.89	2.03	1.99	1.96	1.92
Water content (%)	7.7	11.5	14.6	17.5	19.7	21.2

Volume of mould 945 cc and G = 2.67.

Determine the maximum dry densithy and optimum moisture content also plot 100% and 80% saturation lines.

(b) Define :- (i) Coeffecient of compressibility, (ii) Compression index, (iii) Over consolidation ratio (OCR).   **6**

(c) A saturated soil has $C_C = 0.27$. Its void ratio at stress of 125 KN/m^2 is 2.04 and its permeability is 3.5×10^{-8} cm/s. Compute :-   **8**

    (i) Change in void ratio if stress is increased to 187.5 KN/m^2.

    (ii) Settlement if soil stratum is 5m thick.

    (iii) Time required for 50% consolidation to occur if drainage is one way and $T_V = 0.196$.

7. (a) Explain the factors effecting shear strength of cohesionless soils.   **5**

   (b) The following results were obtained from CU test on normally consolidated clay plot the strength envelop in terms of total stress and effective stress and determine the strength parameters.   **8**

S.No.	Cell pressure	Deviator stress	Pore pressure
1.	250	152	120
2.	500	300	250
3.	750	455	350

   (c) Briefly describe standard penetration test for cohesionless soil along with corrections applied.   **7**

_____