



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

1. a) Write short note on Formation of soil. 6
 b) A partially saturated soil from an earth fill has a natural water content of 19% and bulk unit Weight of 19.33 kN/m³. Assuming the specific gravity of soil solid as 2.6, compute the degree of saturation and void ratio if subsequently the soil gets saturated, determine the dry unit weight and saturated unit weight. 7
- OR**
2. a) A soil sample from field has a volume of 400 cm³ and a weight of 450 gm. The water content of soil is 11% and G= 2.62. Find void ratio, degree of saturation and porosity. 7
 b) Derive the relationship $\rightarrow Y = \frac{(G + esr)Y_w}{1 + C}$ 6
3. a) Explain the use of plasticity chart for classification of soils. 6
 b) The following is the result of a liquid limit test: Determine the liquid limit of a soil. If the plastic limit of the soil is 23% Find out the flow index. Natural water content were 18% Find consistency Index & liquidity Index. 8
- | Number of blows | Water content |
|-----------------|---------------|
| 50 | 34.1 |
| 35 | 39 |
| 26 | 42 |
| 20 | 47 |
| 15 | 53 |
| 10 | 60 |
- OR**
4. a) The plastic limit and liquid limit of a soil are 30% and 42% respectively. The percentage volume change from the liquid limit to dry state is 35% of the dry volume. Similarly, the percentage volume change from the plastic limit to dry state is 22% of the dry volume. Determine the shrinkage limit and shrinkage ratio. 7
 b) Enlist Different methods of determination of water content. Explain any three in detail. 7
 5. a) What will be the ratio of average permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three horizontal layers, if the thickness and permeability of the second layer are twice of those of the first and those of the third layer twice those of second? 7

- b) Explain different factors which affecting the permeability of soil. 6
- OR**
6. a) Explain 'Quick Sand Condition'. Derive the equation for critical hydraulic gradient. 7
- b) Write a short note on properties of flow net. 6
7. a) Write short note on. 6
- i) Stress isobar.
- ii) Vertical pressure distribution on horizontal plane.
- b) A footing size 4m X 4m carries a uniformly distributed load of 150kN/m². Compute vertical pressure at a depth of 6m below the center and corner of the loaded area by equivalent point load method. 7
- OR**
8. a) Explain the construction and use of Newmark's influence chart. 6
- b) A concentrated load of 1000 kN is applied at the ground surface. Compute the vertical pressure. 7
- i) At a depth of 4m below the load.
- ii) At a distance of 3m at the same depth.
9. a) Explain different factors affecting compaction of soil. 6
- b) Determine maximum dry density and the optimum moisture content, with the following data of compaction test on a soil. Volume of mould = 1000 cm³. G = 2.7. 7
- | | | | | | |
|--------------------------------|-------|-------|-------|-------|-------|
| Water Content (w) % | 10 | 12 | 14.3 | 16.1 | 18.2 |
| Weight of compacted sample (N) | 18.88 | 20.55 | 21.09 | 20.85 | 20.30 |
- OR**
10. a) Explain: 6
- i) Coefficient of compressibility.
- ii) Coefficient of volume change.
- iii) Compression index.
- b) In the laboratory test on a clay sample of thickness 25 mm drained at top only, 50% consolidation occurred in 10 minutes. Find the time required for the corresponding clay layer in the field, 2m thick and drained at top and bottom to undergo 70% consolidation. Assume T₅₀ = 0.197 and T₇₀ = 0.405 7
11. a) Explain Mohr-Coulomb theory for shear strength of soil. 7
- b) If the major & minor principal stresses on a specimen of soil at the instant of failure are 500 kN/m² & 150kN/m² respectively. Calculate the values of normal & shear stress on a plane inclined at an angle of 65° with major principal plane. 7
- OR**
12. a) Enlist the various shear test depends upon drainage condition and explain vane shear test in detail. 7
- b) An unconfined compression test was conducted on a disturbed sample of clay. The sample had a diameter of 37.5 mm and was 80 mm long. The load at failure measured by the proving ring was 28 N and the axial deformation of sample at failure was 13 mm. Determine the unconfined compressive strength and the undrained shear strength of clay. 7
