B.E. Fourth Semester (Civil Engineering) (C.B.S.)

Geotechnical Engineering - I

P. Pages : 3 **NKT/KS/17/7264**

Time : Three Hours * 0 4 9 6 * Max. Marks : 80

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. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.

1. a) Write a short note on formation of soil giving names of soil on basis of mode of deposition. **6**

b) A natural deposit a bulk unit weight of 18.44 kN/m^3 and water content of 5%. Calculate the amount of water required to be added to 1 cubic meter of soil to raise the water content to 15%. Assume the void ratio to remain constant. What will then the degree of saturation? Assume G = 2.67 **7**

OR

2. a) Derive the relation $\gamma_d = \frac{G. \times \gamma_w}{1+e}$ **6**

b) A soil in it's natural state has, when fully saturated, a water content of 32.5%. Determine the void ratio, dry and total unit weights. Calculate the total weight of water required to saturate soil mass of volume 10 m^3. Assume, G = 2.69. **7**

3. a) Define Consistency Index & explain it. **6**

b) A test for determination for liquid limit was carried out on a soil sample. The following tests of observation were taken. Determine liquid limit & flow index. **7**

No. of Blows (N)	Water content (%)
38	47.3
27	49.6
20	53
13	55

OR

4. a) Explain the use of particle size distribution curve. **6**

b) Define : **7**
i) Effective Diameter
ii) Coefficient of uniformity
iii) Coefficient of curvature
if, D_{10} = 0.16 mm, D_{30} = 0.19 mm and D_{60} = 0.22 mm
Calculate :
i) Coefficient of uniformity and coefficient of curvature.
ii) Classify the type of soil.

5. a) Discuss various factors affecting permeability of soil. **6**

b) The following data was recorded in a constant head permeability test : **7**
i) Diameter of sample = 75 mm
ii) Head loss in a length of 180 mm = 247 mm
iii) Quantity of water collected in 60 sec = 626 ml
iv) Void ratio = 0.785
Calculate coefficient of permeability of soil. Also determine discharge and seepage velocities.

OR

6. Write a short note **any three.** **13**

i) Application of flownet

ii) Quick sand condition.

iii) Darcy's law & it's validity.

iv) Soil structure

v) Remedial measure to reduce seepage pressure in hydraulic structures.

7. a) Discuss assumption and limitations of Boussinesq approach as applied for determination of stresses induced in a soil mass due to surface loading. **6**

b) A point load of 5 tonnes acts on the surface of ground. Calculate the vertical pressure due to this load at depths of 5.00 & 6.00 m at 3.00 m Horizontally away from the axis of loading in both the cases. **7**

OR

8. a) Write a short note on followings : **6**

i) Stress isobar.

ii) Vertical pressure distribution of horizontal plane.

iii) Vertical pressure distribution on vertical line.

b) A uniformly loaded rectangular area 2 x 3 m has a loading intensity of 200 kN/m^3. Calculate the component of vertical stress at a depth of 3 m below the centre and at the corner of loaded area. **7**

9. a) State the equation for final consolidation settlement & explain the terms in this equation. **6**

b) In a laboratory consolidation test a 25 mm thick sample takes 60 minutes to reach 50% consolidation. How much time will be a 4.5 m thick layer of clay in the field required to attain - (i) 50% (ii) 90% consolidation if it can drain both at top & bottom. **8**

OR

10. a) State the factors affecting compaction of soil. **6**

b) Following are the results of a compaction test : **8**

Wt. of mould + wet soil (grams)	2925	3195	3150	3125	3070
Water content (%)	11.0	13.0	15.3	16.2	18.4

volume of the mould = 1000 c.c.
Wt. of mould = 1000 grms
Sp. Gravity of soil solids = 2.7
Find :

i) OMC and y_d max .
ii) Plot zero air void line
iii) Degree of saturation at γ_d max .

11. a) Using a Mohr's diagram drive a relationship between major & minor principal stress in a terms of shear parameters. **7**

b) If the major & minor principal stresses on a specimen of soil at the instant of failure are 500 kN/m^2 & 150 kN/m^2 respectively. Calculate the values of normal & shear stress on a plane inclined at a angle of 65° with major principal plane. **7**

OR

12. a) Explain what is meant by sensitivity of soil. How soil are classified on the basis of sensitivity. **7**

b) The stresses on a failure plane in a drained test on a cohesionless soil are as under normal stress (σ) is 95 kN/m^2 & shear stress (τ) 45 kN/m^2. **7**

i) Determine the angle of shearing resistance & angle which the failure plane make with the major principal plane.
ii) Find the major & minor principal stress.

****