Geotechnical Engineering - I
Paper – II

P. Pages : 3

Time : Three Hours

TKN/KS/16/7352

Max. Marks : 80

0472

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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 Question 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.
11. Illustrate your answers whenever necessary with the help of neat sketches.
12. Use of non programmable calculator is permitted.

1. a) Write a brief note on "Soil Formation". **6**

b) A relative density test conducted on a sandy soil yielded the following results. Maximum void ratio = 1.20, Minimum void ratio = 0.40, relative density 40%, G = 2.67. **7**
Find dry density of the soil in the present state. If 3m thick of this stratum is densified to relative density of 60%. How much it will reduce in thickness? What will be new density in dry & saturated condition.

OR

2. a) Derive from the first principles,
W. G. = e. Sr. **6**

b) A clay sample is found to weight 445.54 gms in its natural state. It is then dried in an electric oven at 105ºC. The dried weight is found to be 327.56 gm. The specific gravity of the solids is 2.7 & unit weight of the soil mass in its natural state is 1.7 gm/cc. **7**
Determine the water content, degree of saturation & the dry unit weight of the mass in its natural state.

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 observations 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)	Write a note on Textural classification of soils.	**6**
	b)	Determine flow index, liquidity index & consistency index, if L.L. = 67%, P.L. = 33%. natural water content = 43% & given that at water content of 30%, the no. of blows in liquid limit test were 48.	**7**
5.	a)	What are the factors affecting permeability of soil?	**7**
	b)	A falling head permeability test was carried on 15 cm long clay sample. The diameter of sample & stand pipe was 10 cm & 0.75 cm respectively. The level of water in stand pipe dropped from 60 cm to 45 cm in 15 minute. Determine : 1. Permeability in m/day. 2. Time required for level drop to 10 cm.	**7**

OR

6.	a)	Write a short note on properties of flow net.	**6**
	b)	What are remedial measures to reduce seepage pressure in hydraulic structure.	**4**
	c)	Define the terms :	**4**
		i) Hydraulic Head.	
		ii) Hydraulic Gradient.	
7.	a)	Discuss assumptions 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)	Explain the terms Isobars, Pressure bulb.	**6**
	b)	A rectangular area $1.5\,m \times 3.0\,m$ carries a uniformly distributed load of $50\,KN/m^2$ at the ground surface. Find the vertical pressure at 4.0 m below the centre and corner of the loaded area by equivalent point load method.	**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 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.	**7**

OR

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

b) Following data is for a standard compaction test on soil using a mould of volume 1000 cm^3. **7**

Water content (%)	Wt. of compacted sample (N)
8.5	18.5
12.5	20
13.75	20.5
15.5	20.8
18.2	20.4
20.2	19.8

Determine optimum moisture content and maximum dry density values.

11. a) Using a Mohr's diagram derive a relationship between major & minor principal stress in 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. **7**
Calculate the values of normal & shear stress on a plane inclined at an angle of 65° with major principal plane.

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 is (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.

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