BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
B.Tech.Sem - IV CIVIL :SUMMER- 2022
SUBJECT : GEOMECHANICS

Day : Monday
Date : 20-06-2022

S-24373-2022

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Use of non-programmable calculator is **allowed**.
4) Assume suitable data **WHEREVER** necessary.
5) Draw neat diagram **WHEREVER** necessary.

Q.1 **a)** Define soil as a three phase system. Elaborate when the soil will behave as two phase system. **04**

b) Define : i) Void ratio ii) Porosity. Derive relationship $1-n=\frac{1}{1+e}$. **06**

OR

Q.1 **a)** The void ratio of a soil sample is 0.5 and the degree of saturation is 65%. Calculate the water content and bulk unit weight of soil. Assume specific gravity G = 2.65. **04**

b) Draw a plasticity chart as per IS classification system and give the names of following soils CL, CI, CH, MI, OI and OH. **06**

Q.2 **a)** Calculate the coefficient of uniformity and coefficient of curvature for soil sample which D_{10} = 0.53 mm, D_{30} = 0.98 mm and D_{60} = 1.5 mm. **04**

b) What is consistency of soil? List and define various Atterberg consistency limit. **06**

OR

Q.2 Enlist methods of determining field density of soil? Explain core cutter method with a neat sketch. **10**

Q.3 **a)** State and explain Darcy's law. **04**

b) Determine the coefficient of permeability of soil from the following data : **06**

i) cross sectional area of the sample = 40 cm^2
ii) length of soil sample : 30 cm
iii) head of water = 40 cm
iv) discharge = 250 ml in 110 sec.

OR

Q.3 **a)** Derive the relationship for quick sand condition as $i_c=\frac{G-1}{1+e}$. **04**

b) At a construction site, a 3m thick clay layer is followed by 4m thick gravel layer which is resisting on impervious rock. A load of 20kN/m^2 is applied suddenly at the surface. The saturated unit weight of the soils are 18 kN/m^3 and 21kN/m^3 for the clay and gravel layers respectively. The water table is at the ground surface. Draw diagram showing variation with depth of total, neutral and effective stress in the layer. **06**

Q.4 **a)** Differentiate between the Boussineq's and Westergaard's theory for stress distribution. **04**

b) Calculate the vertical stress intensity at a depth of 4.5m below the center of a rectangular loaded base 3.5m x 4m carrying a load of 100kN/m^2. Use equivalent point load method. **06**

OR

Q.4 **a)** Determine dry density and void ratio of soil sample having water content of 15% and Degree of saturation of 90%. Assume specific gravity of soil = 2.65. **04**

b) What is compaction curve? Give it salient features. Define zero air void line. **06**

Q.5	**a)**	Explain three drainage conditions for conducting shear test of soil.	**04**
	b)	An unconfined compression test was carried out on a saturated clay sample. The maximum load the clay sustained was 150N and the vertical displacement was 1mm. The size of the sample was 38mm diameter and 76mm long. Determine the shear strength of soil.	**06**

OR

Q.5	**a)**	Draw shear strength envelop for purely cohesive and cohesionless soil with sketch.	**04**
	b)	Explain advantages and disadvantages of direct shear test over triaxial shear test.	**06**

Q.6		A retaining wall 12m high retains a cohesionless soil having an angle of internal friction of 38°. The surface of soil is level with top of wall. The top 4m of the fill has a unit weight of 20kN/m^3 and that of the rest is 25 kN/m^3. Calculate the magnitude per meter run and point of application of the resultant active thrust. Assume angle of friction the same for both the strata.	**10**

OR

Q. 6	**a)**	Explain active and passive earth pressure with respect to wall movement with sketch.	**04**
	b)	A vertical wall with a smooth face is 7.2m high and retains soil with a uniform surcharge angle of 9°. If the angle of internal friction of soil is 27°. Calculate the active earth pressure if unit weight of soil γ = 20kN/m^3	**06**

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