

**ANURAG Engineering College**

(An Autonomous Institution)

III B.Tech I Semester Supplementary Examinations, December-2024

**GEOTECHNICAL ENGINEERING**

(CIVIL ENGINEERING)

**Time: 3 Hours****Max. Marks: 75****Section – A (Short Answer type questions)**(25  
Marks)**Answer All Questions**

	Mar ks	CO	B.T Lev el
1. Determine the coefficient of curvature if $D_{10}=0.125\text{mm}$ , $D_{30}=0.625\text{mm}$ , $D_{60}=1.875\text{mm}$	2M	CO1	L2
2. Draw the phase diagram of a soil sample.	3M	CO1	L1
3. Deduce the relation between seepage velocity and discharge velocity.	2M	CO2	L2
4. If saturated unit weight of soil is given by $20.25\text{kN/M}^3$ and unit weight of water is given by $9.81\text{kN/M}^3$ , determine critical hydraulic gradient	3M	CO2	L2
5. Express the formula for determination of stress distribution under point load according to Westergaard's theory.	2M	CO3	L1
6. Define the term 'Compaction of soil'.	3M	CO3	L1
7. Define the term coefficient of compressibility of soil and write its units	2M	CO4	L1
8. Write an expression for time factor in terms of coefficient of consolidation and explain the terms involved in it.	3M	CO4	L1
9. Write an expression for maximum angle of obliquity in shear stress analysis.	2M	CO5	L1
10 Draw the Mohr circle presented in unconfined compressive strength of soil.	3M	CO5	L2

**Section B (Essay Questions)****Answer all questions, each question carries equal marks.****(5 x 10M = 50M)**

- 11 Explain the terms with the help of three-phase diagram, void ratio, degree of saturation, water content and bulk unit weight.

A)

**OR**

- B) A specimen of soil having a volume of 300 CC weighs 550 gm in wet condition. Determine voids ratio, degree of saturation, porosity and water content of the soil specimen if after oven drying at  $105^\circ\text{C}$  for 24 hours, its weight reduced to 472 gm. Take  $G = 2.67$ .

- 12 Calculate the coefficient of permeability of a soil sample, 6cm in height and  $50\text{cm}^2$  in a cross-sectional area, if a quantity of water equal to 450ml passed down in

A) 10minutes under an effective constant head of 40cm.

**OR**

- B) A soil profile consists of layers of thickness equal to 2m, 3m and 4m with coefficient of permeability equal to  $2 \times 10^{-4}$  cm/sec,  $3.5 \times 10^{-3}$  cm/sec and  $2 \times 10^{-3}$  cm/sec. Find the equivalent coefficient of permeability, when the flow is perpendicular to the layers. 10M CO2 L3
- 13 A concentrated load of 30kN acts on the surface of a homogenous soil mass of large extent. Find the stress intensity at a depth of 8m and  
A) i) Directly under the load ii) At a horizontal distance of 6 m. 10M CO3 L3

OR

- B) The optimum moisture content of soil is 14.50% and its maximum dry density is  $17.50 \text{ kN/m}^3$ . The specific gravity of soil grain is 2.60. Determine: (a) The degree of saturation and (b) Percentage of air voids of the soil at OMC. 10M CO3 L3
- 14 In a laboratory, the consolidation test was performed on a specimen of clay 3cm thick. The sample was drained at top and bottom. The time required for 50% consolidation of the sample was observed to be 15 minutes. Determine the coefficient of consolidation of clay. Calculate time required for 50% and 90% consolidation for this clay deposit in the field 3m thick and drained at both ends. 10M CO4 L3  
A)

OR

- B) Describe the consolidometer test. Explain results of consolidometer test with neat sketches. 10M CO4 L3
- 15 A CU triaxial test was conducted on saturated clay. When the confining pressure was  $200 \text{ kN/M}^2$ , the sample failed at a deviator stress of  $500 \text{ kN/M}^2$ . The pore water pressure was  $150 \text{ kN/M}^2$ . The failure plain occurred at an angle of  $60^\circ$  to the horizontal. Determine normal and shear stresses on the failure plane at failure. 10M CO5 L3  
A)

OR

- B) The following results were obtained from a CU test on a normally consolidated clay. Plot the strength envelope in terms of total stresses and effective stresses and determine the strength parameters. 10M CO5 L3

S.NO	Cell pressure (kN/m <sup>2</sup> )	Deviator stress (kN/m <sup>2</sup> )	Pore water Pressure (kN/m <sup>2</sup> )
1.	250	152	120
2.	500	300	250
3.	750	455	350