R18 Regulation *Subject code:* **2P4AE**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, July 2021

SOIL MECHANICS

(CIVIL ENGINEERING)

Maximum Marks: 70 Date:06.08.2021 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Define bulk density of soil.
2 Explain the classification of soils based on their mode of formation
3 What is quick sand condition?
4 Describe the permeability of stratified soil deposits for vertical flow
5 Explain the terms zero air void, degree of compaction and OMC
6 State the assumption is Westergaard's theory?
7 State the significance of coefficient of consolidation?
8 Estimate the consolidation settlement if the present average overburden stress of the layer is 70 kN/m^2 and the increase in average stress in the layer is 80 kN/m^2.
9 List out the methods available for measuring shear strength
10 Define stress path.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 a) The porosity of a soil sample is 50 % and the specific gravity of its particles is 2.65. Calculate its void ratio, dry unit weight, saturated unit weight and submerged unit weight. Also calculate the bulk unit weight of soil, if degree of saturation is 65 %. (5M)

b) What are the index properties of soils? Discuss about the various structures of soils. (5M)

OR

12 a) The sieve analysis of a soil gave the following results. (5M)

% passing 75μ sieve = 4
% Retained on 4.75mm sieve = 50
Coefficient of curvature = 2
Uniform coefficient = 5
Classify the soil, according to ISC system?

b) Explain method of sieve analysis use for separation of particles in course grained soils. (5M)

13 a) A sand deposit is 10m thick and overlies a bed of soft clay. The ground water table is 3m below ground surface. If the sand above ground water table as a degree of

saturation of 45%. Plot the diagram showing the variation of total stress, pore water pressure and effective stress. Take e = 0.70, G = 2.65. (5M)

b) What is a flow net? Write down the properties and uses of flow net. (5M)

OR

14 a) Briefly describe the Constant head laboratory method for determining co-efficient of permeability. (5M)

b) The following data were recorded in a constant head permeability test.

Internal diameter of Permeameter = 7.0 cm

Head lost over a sample length of 20 cm = 25.6 cm

Quantity of water collected in 60 s = 650 ml

Porosity of the soil sample was 44 %. Calculate the co-efficient of permeability. (5M)

15 a) Using Boussinesq's equation, derive the vertical stress at depth 'z' beneath the centre of uniformly loaded circular area. (5M)

b) What are the factors affecting compaction of soil? (5M)

OR

16 a) A concentrated load of 50 kN acts on the surface of a soil. Determine the vertical stress increments at points directly below the load upto a depth of 6 m and draw a plot. Also plot the variation of vertical stress increment due to load on horizontal plane at depth 1 m upto a horizontal distance of 3m on either side of centre. (5M)

b) What are the important effects of compaction. (5M)

17 a) Explain with suitable analog Terzaghi's theory of 1-D consolidation of soil. (5M)

b) A 8 m thick clay layer with single drainage settles by 120 mm in 2 years. The coefficient of consolidation for this clay was found to be 6×10^{-3} cm^2/s. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90 % of this settlement. (5M)

OR

18 A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm^2. Calculate the coefficient of compressibility (a_v) and the coefficient of volume compressibility (m_v). If the coefficient of consolidation determined in the test for the given stress increment was 10 m^2/year, calculate the coefficient of permeability in cm/s. If the sample tested at the site was taken from a clay layer 3.0 m in thickness, determine the consolidation settlement resulting from the given stress increment (10M)

19 a) Explain unconfined compression test for determining shear strength of soil. (5M)

b) What are the different laboratory tests for measurement of shear strength of soil. (5M)

OR

20 a) Determine the shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 180 kN/m^2 and the pore water pressure is 75 kN/m^2. The effective stress shear strength parameters for the soil are: $c' = 15$ kN/m^2 and $\phi' = 30^o$. (5M)

b) State Mohr coulomb model for stress? (5M)