R20 Regulation *Subject code:3P5AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, May 2025

SOIL MECHANICS

(CE)

Maximum Marks: 70 Date: 24.06.2025 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.
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)		Marks	CO	BTL
1	The specific gravity of a soil sample is 2.7 and its void ratio is 0.945. if it is fully saturated, what will be the moisture content of the soil?	2M	1	L1
2	Explain thixotropy and sensitivity of soil.	2M	1	L1
3	What is Darcy's law ? what are it's limitations?	2M	2	L1
4	What is critical hydraulic gradient?	2M	2	L1
5	Define pressure bulb and what will be the maximum depth of pressure bulb for a footing of width B?	2M	3	L1
6	Write short notes on placement water content.	2M	3	L1
7	Define expansion index.	2M	4	L1
8	What is secondary consolidation of soils?	2M	4	L1
9	Why triaxial shear test is considered better than direct shear test?	2M	5	L1
10	What is the effect of pore pressure on shear strength of soil?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	There are two borrow areas A and B which have soils with void ratios of 0.80 and 0.70, respectively. The inplace water content is 20%, and 15%, respectively. The fill at the end of construction will have a total volume of 10,000 m^3, bulk density of 2 Mg/m^3 and a placement water content of 22%. Determine the volume of the soil required to be excavated from both areas. G = 2.65. If the cost of excavation of soil and transportation is Rs. 200/- per 100 m^3 for area A and Rs 220/- per 100 m^3 for area B, which of the borrow area is more economical?	10M	1	L2
	OR			
12	a)Prove that SR = G_m Where SR = shrinkage ratio b)The plastic limit and liquid limit of soil are 33% and 45% respectively. The percentage volume change from the liquid limit to the dry state is 36% of the dry volume. Similarly the percentage volume change from the plastic limit to the dry state is 24% of the dry volume. i)The shrinkage limit will be? ii) Shrinkage ratio of the soil will be?	5M 5M	1	L2

13	a) What is seepage velocity and coefficient of percolation ? b) Determine the average coefficient of permeability in the horizontal and vertical directions for a stratified deposit consisting of three layers of thickness 5m, 1m, 2.5m and having the coefficients of permeability of 3×10^{-2} mm/sec, and 3×10^{-5} mm/sec, and 4×10^{-2} mm/sec, respectively. Assume the layers are isotropic.	5M 5M	2	L2
	OR			
14	A sand deposit is 10m thick and overlies a bed of soft clay. The ground water table is 3m below the ground surface. If the sand above the ground water table has a degree of saturation of 45%, plot the diagram showing the variation of the total stress, pore water pressure and the effective stress. The void ratio of the sand is 0.70. take G = 2.65.	10M	2	L2
15	Determine the stresses at a point at a depth 'z' below the ground level due to a) Point load b) Circular load	5M 5M	3	L2
	OR			
16	A sample of soil was prepared by mixing a quantity of dry doil with 10% by mass of water. Find the mass of this wet mixture required to produce a cylindrical, compacted specimen of 15cm diameter and 12.5cm deep and having 6% air content. Find also the void ratio and the dry density of the specimen if G = 2.68.	10M	3	L2
17	What is primary consolidation. Discuss the spring analogy for primary consolidation. What are its uses?	10M	4	L2
	OR			
18	How would you determine the time-settlement curve in the field?	10M	4	L2
19	Explain in detail the determination of shear strength using unconfined compression test.	10M	5	L2
	OR			
20	What is Mohr's circle? Discuss its importance characteristics.	10M	5	L2