Reg. No. | | | | | | | | | | | |

| Question Paper Code | 12064 |

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023
Fourth Semester
Civil Engineering
20CEPC403 - SOIL MECHANICS
(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks, K-Level, CO
1.	What is meant by total stress, neutral stress and effective stress?	2,K1,CO2
2.	Why is there more likelihood of quick sand condition in sands than in clays?	2,K2,CO2
3.	A raft foundation carries an udl of 300kN/m². Estimate the vertical pressure at a depth of 9m. From Newmark's chart, the no. of influence areas counted as 62.	2,K2,CO3
4.	Define time factor. How does it depend on the properties of soil?	2,K2,CO3
5.	What is the shear strength of the soil?	2,K1,CO4
6.	What are shear strength parameters?	2,K1,CO4
7.	What is meant by progressive failure? In which shear test does it take place?	2,K2,CO5
8.	Write down the expression to determine the shear strength of soil by vane shear test.	2,K2,CO5
9.	What are the different factors of safety used in stability of slopes?	2,K2,CO6
10.	Define Taylor's stability number.	2,K1,CO6

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) A foundation trench is to be excavated in a stratum of stiff clay 8m thick, underlain by a bed of sand. In a trial bore hole, the groundwater is observed to rise an elevation of 2m below the ground surface
(i) Find the depth to which excavation can be safely carried out without the danger of the bottom becoming unstable under uplift pressure of ground water. The specific gravity of clay particles is 2.72 and void ratio of 0.72
(ii) If excavation is to be carried safely to a depth of 6m, how much should the water table is lowered in the vicinity of the trench?   13,K3,CO2

OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

b) A falling head permeability test was carried out on a 15cm long sample of silty clay. The diameter of the sample and the stand pipe were 9.8cm and 0.75cm respectively. The water level in the stand pipe was observed to fall from 60cm to 45cm in 12 min. Determine: *13,K2,CO2*
(i) Co-efficient of permeability of the soil.
(ii) Height of water level in the stand pipe after another 20min.
(iii) Time required for the water level to drop to 10cm.

12. a) What is Newmark's chart? How it is helpful in computing the vertical stress at any depth due to loaded area? Explain.   *13,K2,CO3*

<div align="center">OR</div>

b) Discuss Terzaghi's theory of consolidation stating the various assumptions and their validity.   *13,K2,CO3*

13. a) What is the pole of a Mohr's circle? Explain with a sketch how it can be used to determine the stresses on any plane in a soil element subjected to external stresses.   *13,K2,CO4*

<div align="center">OR</div>

b) (i) Explain stress-strain and volume change characteristics of cohesion less soils during shear.   *8,K2,CO4*
(ii) Define critical void ratio and explain how it can be determined for cohesion less soil.   *5,K2,CO4*

14. a) Write down a step by step procedure for determination of cohesion of a given clayey soil by conducting unconfined compression tests.   *13,K2,CO5*

<div align="center">OR</div>

b) Derive the equation for Skempton pore pressure parameters.   *13,K2,CO5*

15. a) Derive from the first principle, the factor of safety of an infinite slope made of (i) Cohesion less soil and (ii) c-φ soil.   *13,K2,CO6*

<div align="center">OR</div>

b) (i) Discuss the stability analysis of slopes by Fellenius method.   *5,K2,CO6*

(ii) An embankment 10m high is inclined at an angle of 35° to the horizontal. A stability analysis by the method of slice gave the following forces per unit length: *8,K2,CO6*

        ΣShearing forces = 440 kN
        ΣNormal forces = 880 kN
        ΣNeutral forces = 200 kN

The length of the failure arc is 26m. Laboratory tests on the soil indicated the effective values c' and φ' as 20 kN/m^2 and 18° respectively. Determine the factor of safety of the slope with respect to (a) shear strength and (b) cohesion.

PART - C (1 × 15 = 15 Marks)

16. a) (i) Explain the Indian Standard Method of classifying the fine grained soil. 9,K2,CO1

      (ii) Differentiate between. 6,K2,CO1
- a) Liquidity index and consistency index.
- b) Flow index and toughness index.
- c) Plasticity and consistency.

OR

b) An embankment having total volume of 2000m^3 is to be constructed having a bulk density of 1.98g/cc and a placement water content of 18%. The soil is to be obtained either from borrow area A or borrow area B, which have void ratio of 0.78 and 0.69 respectively and water content of 16% and 12% respectively. Take G =2.66 for both the soils. Determine the volume of soil required to be excavated from each of the areas. If the cost of excavation is Rs.35 per m^3 in each area, but cost of transportation is Rs.32 and Rs.36 per m^3 from areas A and B respectively, which of the borrow area is more economical? 15,K2,CO1