

B.E. / B.Tech – DEGREE EXAMINATIONS, NOV / DEC 2025

Fourth Semester

Civil Engineering

20CEPC403 – SOIL MECHANICS

Regulations - 2020

(Graph sheet shall be provided)

Duration: 3 Hours

Max. Marks: 100

PART-A(MCQ)(10×1=10Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. Which of the following soil has uniformity coefficient more than 10? (a) Coarse soil (b) Poor soil (c) Uniform soil (d) Well graded soil	1	K1	CO1
2. Which of the following roller is used to compact the fine grained soil? (a) Drum roller (b) Pneumatic tyred roller (c) Sheep foot roller (d) Tamping roller	1	K1	CO1
3. Darcy's law is not valid for _____ (a) Clay (b) Silt (c) Fine sand (d) Gravel	1	K1	CO2
4. In a laboratory, coefficient of permeability of soil is determined by one of the following methods (a) Constant head test (b) Horizontal capillary test (c) Pumping in test (d) Pumping out test	1	K1	CO2
5. The depth at which vertical stress is 20% of load intensity is known as _____ (a) Conjugate depth (b) Equivalent depth (c) Sequent depth (d) Significant depth	1	K1	CO3
6. The slope of the e – logp curve for a soil mass gives _____ (a) coefficient of permeability (b) coefficient of consolidation (c) coefficient of volume change (d) compression index	1	K1	CO3
7. Mohr's circle can be drawn _____ (a) at the time of loading (b) before loading (c) during testing (d) at failure condition only	1	K1	CO4
8. In a shear test on cohesion less soils, if the initial is less than critical void ratio, the sample will _____ (a) increase in volume (b) decrease in volume (c) initially decrease and then increase in volume (d) initially increase in volume and then remains constant	1	K2	CO4
9. A clay having an unconfined compression strength of 160 kN/m ² would be classified as _____ (a) soft (b) very soft (c) stiff (d) hard	1	K1	CO5
10. The friction circle method is based on the assumption that the resultant reaction along a slip surface is tangential to a circle of radius _____ (a) $R \sin\phi$ (b) $R^2 \sin\phi$ (c) $R \cos\phi$ (d) $R \sin\phi \cos\phi$	1	K1	CO6

PART-B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Write short notes on phase diagram of soil with neat sketch.	2	K2	CO1
12. List out the common methods of determining moisture content in the lab.	2	K1	CO1
13. Differentiate seepage velocity from discharge velocity.	2	K2	CO2
14. What is meant by piping? How can it be reduced?	2	K2	CO2
15. Write down the Boussinesq equation for finding out the vertical stress under a single concentrated load.	2	K2	CO3

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| 16. Define degree of consolidation. | 2 | K1 | CO3 |
| 17. Draw the failure envelope for cohesive and cohesion less soils. | 2 | K2 | CO4 |
| 18. State different types of shear failure. | 2 | K1 | CO4 |
| 19. What is meant by progressive failure? In which shear test does it take place? | 2 | K1 | CO5 |
| 20. What are Skempton's pore pressure parameters? | 2 | K1 | CO5 |
| 21. What do you mean by tension crack? | 2 | K1 | CO6 |
| 22. Define Taylor's stability number. | 2 | K1 | CO6 |

PART-C (6 × 11= 66 Marks)

Answer ALL Questions

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| 23. a) Define the following terms:
(a) Void ratio (b) Porosity (c) Degree of Saturation (d) Unit weight of Solids and
(e) Specific gravity of solids. | 11 | K2 | CO1 |
| OR | | | |
| b) Describe the step-by-step procedure for classifying the soils as per IS: 1498 – 1970. | 11 | K2 | CO1 |
| 24. a) A sand deposit is 10m thick and overlies a bed of soft clay. The groundwater table is 3m below the ground surface. If the sand above the groundwater table has a degree of saturation 45%. The void ratio of the sand is 0.7. Take $G_s = 2.65$. Plot the diagram showing the variation of total stress, pore water pressure and the effective stress. | 11 | K3 | CO2 |
| OR | | | |
| b) Derive Laplace's equation of continuity for two dimensional steady flow of water through an isotropic soil. | 11 | K3 | CO2 |
| 25. a) What is Newmark's chart? Explain how it is helpful in computing the vertical stress at any depth due to loaded area. | 11 | K2 | CO3 |
| OR | | | |
| b) Explain Taylor's square root time method for determining the coefficient of consolidation. | 11 | K2 | CO3 |
| 26. a) Derive the relation between principal stresses at failure and shear strength parameters. | 11 | K3 | CO4 |
| OR | | | |
| b) A cylindrical specimen of a saturated soil fails at an axial stress of 167 kPa in an unconfined compression test. The failure plane makes an angle of 54° with the horizontal. Calculate the shear strength parameter. Verify by graphical method. | 11 | K3 | CO4 |
| 27. a) Explain in detail with neat sketches the procedure of conducting tri-axial shear test in the laboratory. | 11 | K2 | CO5 |
| OR | | | |
| b) Write down a step-by-step procedure for determination of cohesion of a given clayey soil by conducting unconfined compression tests. | 11 | K2 | CO5 |
| 28. a) Explain briefly the procedure of friction circle method of analysis of soil stability with neat sketches. | 11 | K2 | CO6 |
| OR | | | |
| b) Explain briefly the procedure of Fellenious method of analysis of soil stability with neat sketches. | 11 | K2 | CO6 |