

Roll No.

OLE-3203

B. Tech. 5th Semester (Civil Engg.) Examination – April, 2021

SOIL MECHANICS

Paper : PCC-CE-305-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question No. 1 is *compulsory*. Attempt *one* question from each Section. All questions carry equal marks. Assume missing data, if any, suitably.

1. Describe the following : 2.5 × 6 = 15
- (a) Consistency limits of soil
 - (b) Validity of Darcy's law
 - (c) Use of protective filter
 - (d) Determination of Maximum Dry density
 - (e) Contact pressure
 - (f) Different drainage conditions

SECTION – A

2. (a) A natural soil deposit has a bulk unit weight of 18.44 kN/m^3 and water content of 5%. Calculate the amount of water required to be added to 1 cubic metre of soil to raise the water content to 15%. Also, determine the degree of saturation if the void ratio remains constant. Assume $G = 2.67$. 8
- (b) Explain in detail the particle size distribution curve. How can we determine different coefficients from this curve? 7
3. (a) What is the necessity of soil classification? Explain textural classification of soil. 7
- (b) In a falling head permeability test, head causing flow was initially 50 cm and it drops 2 cm in 5 minutes. How much time required for the head to fall to 25 cm? 8

SECTION – B

4. (a) What is the principal of effective stress? Determine effective stress under hydrostatic condition. 7
- (b) A sand deposit consists of 2 layers. The top layer is 2 m thick ($\rho = 1705 \text{ kg/m}^3$) and bottom layer is 3.5 m thick ($\rho_{\text{sat}} = 2065 \text{ kg/m}^3$). The water table is at a depth of 3.5 m from the surface and the zone of capillary saturation is 0.5 m above water table. Draw the diagram showing variation of stresses and determine effective stress at each section. 8

5. (a) Differentiate between compaction and consolidation. Describe the factors affecting the compaction. 7
- (b) Describe the role of moisture and compactive effect in compaction. Explain the laboratory determination of optimum moisture content. 8

SECTION – C

6. (a) Explain Westergaard's theory for the determination of the vertical stress at a point. How is it different from Boussinesq's equation ? 7
- (b) What are the approximate stress distribution methods for loaded areas ? Explain any one in detail. 8
7. Describe the following : 15
- (i) Time rate of consolidation
 - (ii) Newmark's influence chart
 - (iii) Normally and over consolidated clay
 - (iv) Coefficient of volume change
 - (v) Primary and secondary consolidation

SECTION – D

8. (a) Derive a relationship between the principal stresses at failure and the shear strength parameters of the soil using Mohr-Coulomb equation. 7

- (b) What are the different tests to determine the shear strength of soil ? Explain any *two* in detail. 8
9. (a) Explain active, passive and at rest conditions in earth pressure against a retaining wall. 7
- (b) Explain Coulomb's active and passive earth pressure theory in detail. 8
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