

Roll No. ....

## OLE-24290

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

#### SOIL MECHANICS

Paper : CE-307-F

*Time : Three Hours ]*

*[ Maximum Marks : 100*

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*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.*

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**Note :** Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Describe the following briefly : 20
- (a) Inter-particle forces
  - (b) Sedimentation analysis
  - (c) Flow index
  - (d) Zone of capillary rise
  - (e) Pressure bulb

- (f) Protective filter
- (g) Applications of Newmark's chart
- (h) Factors affecting compaction of soil
- (i) Advantages of vane shear test
- (j) Difference between active and passive earth pressure.

### **UNIT – I**

- 2.** (a) Describe the different consistency limits and consistency indices with diagram. 10
- (b) The mass specific gravity of fully saturated clay, having a water content of 30.5% is 1.96. On oven drying, the mass specific gravity drops to 1.60. Calculate the specific gravity of clay. 10
- 3.** (a) What is the purpose of soil classification ? Explain Indian Standard classification on the basis of plasticity. 10
- (b) What do you mean permeability ? Explain the laboratory and field methods to determine coefficient of permeability. 10

### **UNIT – II**

- 4.** (a) Compute the total, effective and pore pressure at a depth of 15 m below the bottom of a lake 6 m deep. The bottom of the lake consists of soft clay

with a thickness of more than 15 m. the average water content of the clay is 40% and the specific gravity of the soil may be assumed as 2.65. 10

(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. 10

5. (a) What is compaction curve ? Give its salient features. Also define zero air void line. 10

(b) Describe the laboratory and field methods of compaction. Also explain how compaction can be controlled in field. 10

### UNIT – III

6. (a) Explain Westergaard's theory for the determination of the vertical stress at a point. How is it different from Boussinesq's equation ? 10

(b) Describe in detail influence diagram, isobar diagram and contact pressure. 10

7. (a) What are the types of consolidation ? Explain different methods to determine coefficient of consolidation. 10

(b) Describe the following : 10

- (i) Expansion index
- (ii) Coefficient of volume change
- (iii) Coefficient of compressibility
- (iv) Compression index

#### **UNIT – IV**

- 8.** (a) Derive a relationship between the principal stresses at failure and the shear strength parameters of the soil using Mohr-Coulomb equation. 10
- (b) What is shear strength ? What are the different tests to determine shear strength of soil ? Explain under what conditions these tests are used ? 10
- 9.** (a) Explain normally consolidated and over consolidated clay. Also draw pressure void ratio relationships for these. 10
- (b) Explain Rankine's theory for active and passive earth pressure in detail. 10
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