

Roll No. ....

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**B. Tech 5th Sem. (Civil Engg.)  
Examination – December, 2014**

**Soil Mechanics**

**Paper : CE-307-F**

*Time : Three Hours ]*

*[ Maximum Marks : 100*

*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 :** Q. No. 1 is compulsory. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section. Assume suitable data if missing.

1. Write short notes on the following :  $5 \times 4 = 20$

- (a) Black cotton soil
- (b) Consistency Index
- (c) Flow net
- (d) Coefficient of compressibility
- (e) Passive pressure

## SECTION - A

2. (a) A saturated soil sample has a water content of 40%. If the specific gravity of solids is 2.67, determine the void ratio, saturated density and submerged density. 10
- (b) Discuss Indian standard classification system. 10
3. What are the different methods for determination of the permeability in a laboratory? Discuss their limitation. 20

## SECTION - B

4. (a) A deposit of fine sand has a void ratio of 0.54 and the specific gravity of solid particles is 2.67. Compute the safe exit gradient, with a factor of safety 4. 10
- (b) Explain the mechanics of piping in hydraulic structures. What methods are used to increase the factor of safety against piping? 10
5. What is a compaction curve? Give its salient features. What is a zero-air void line? 20

## SECTION - C

6. Explain Westergaard's theory for the determination of the vertical stress at a point. How is it different from Boussinesq's solution? 20
7. (a) In a consolidation test on a soil, the void ratio of the sample decreased from 1.25 to 1.10 when the

pressure is increased from  $200 \text{ kN/m}^2$  to  $400 \text{ kN/m}^2$ . Calculate the coefficient of consolidation if the coefficient of permeability is  $8 \times 10^{-8} \text{ cm/sec}$ .

10

(b) Describe sand drains. Discuss their uses.

10

### SECTION - D

8. Drive a relationship between the principal stresses at failure using Mohr-Coulomb failure criterion. 20

9. What are the assumptions of Rankine's theory? Drive the expressions for active pressure and passive pressure. 20

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