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B.Tech Even Semester (CBCS) Exam., May—2018

AGRICULTURAL ENGINEERING

(6th Semester)

Course No. : AE 603

(Soil Mechanics)

Full Marks : 75

Pass Marks : 30

Time : 3 hours

Note :
1. Attempt **one** question from each Unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

UNIT—1

1. *(a)* Develop functional relationship among e, G, w and Sr for a soil mass. Where,

e = volume of voids; w = moisture content; Sr = degree of saturation; G = specific gravity 7

(b) Establish the relationship

$$Y_d \quad \frac{(1 \quad n_a)Y_w \quad G}{1 \quad wG}$$

where,

Y_d = dry unit weight of soil mass; n_a = air void ratio; w = dry basis water content; G = specific gravity; Y_w = unit weight of water 8

2. *(a)* Classify the soil mass on the basis of degree of saturation. 3

(b) With neat sketch, explain the Atterberg limits. 4

(c) Write short notes on the following : 2×4=8

(i) Unit weight of solids

(ii) Consistency index

(iii) Apparent specific gravity

(iv) Shrinkage limit

UNIT—2

3. *(a)* What is capillary rise? Find the expression of maximum tensile stress. 8

(b) 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 meter of soil to raise the water content to 15%. Assume the void ratio to remain constant, then what will be the degree of saturation? 7

4. (a) Define the permeability and discuss the falling head permeability test with neat diagram for the determination of coefficient of permeability. 9

(b) Draw the effective pressure distribution diagram for submerged soil mass. 6

UNIT—3

5. (a) Explain in brief the basic assumptions of theory of elasticity. 6

(b) With the help of neat sketch, show that the total numbers of independent stress are six for a three-dimensional element. 9

6. (a) Differentiate between body forces and surface forces. 5

(b) Derive equilibrium equations for an elemental volume of size *dx*, *dy* and *dz*. 10

UNIT—4

7. (a) Differentiate between compaction and consolidation. 5

(b) Briefly describe about the optimum moisture content in compaction with the help of a suitable curve. 5

(c) The *in situ* void ratio of a granular soil deposit is 0·50. Then maximum and minimum void ratios of the soil were determined to be 0·75 and 0·35. Specific gravity is 2·67. Determine the relative density and relative compaction of the deposit. 5

8. (a) Briefly describe the factors affecting compaction. 5

(b) Explain the standard and modified proctor test with schematic diagram. 10

UNIT—5

9. (a) Describe the essential points of Mohr's strength theory and draw the Mohr's failure envelope. 7

(b) A cylinder of soil mass when laterally unconfined failed under axial vertical stress of 175 kN/m^2. If the value of soil cohesion is 63·752 kN/m^2, calculate the angle of internal friction of the soil. 8

10. *(a)* Calculate intensity of active earth pressure at a depth of 10 m in dry cohesionless sand having an angle of internal friction of 30° and unit weight of 1·8 t/m^2. 7

(b) Describe briefly about shallow and deep foundation with examples. 8

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