B.Tech Even Semester Examination, May, 2025

Agricultural Engineering
(6th Semester)

Course No: AE-603
(Soil Water and Conservation Engineering)

Full Marks: 70
Pass Marks: 28
Time: 3 hours

Note:
1. Attempt any five questions taking one 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 figure in the right margin indicates full marks for the question
6. All the mathematical symbols and abbreviations have their usual meanings.

UNIT-I

1. Discuss the various factors affecting soil erosion as per the Universal Soil Loss Equation. Explain how each factor contributes to soil loss. 7+7=14

2. (a) Define soil erosion and explain its major types with suitable examples. Discuss the natural and human-induced factors that accelerate soil erosion. 5+5=10

   (b) Determine the terminal velocity and kinetic energy of 2mm and 4 mm diameter of raindrops if atmospheric temperature is $20^{o}C$ pressure 101.325 KPa drag coefficient 0.517 for 2 mm diameter of raindrop and drag coefficient 0.559 for 4mm dia of raindrop. 4

UNIT-II

3. Explain the different mechanical or structural conservation measures used on agricultural land. Discuss the effectiveness of contour bunding, graded bunding, and terraces. 8+6=14

4. (a) Explain the different types of terraces used in soil and water conservation. 8

   (b) A contour bund with the dimension of 45 cm as top width, 65 cm as height, 30 cm as the crest above the ground surface, side slope as 2:1, VI is 1.25 m and total length is 350 m, on a land slope of 2%. To dispose excess water from the contour bund, calculate the size of weir to be used. If rainfall intensity for the time equal to T, is 15 cm/h once in 10 years duration. Assume that during peak rainfall the constant infiltration rate was 2.5 cm/h. 6

UNIT-III

5. Explain classifications of gullies .Describe in detail the stages of gully formation. 8+6=14

6. Explain the concept and purpose of a check dam in soil and water conservation. Classify check dams based on construction material and flow conditions. 7+7=14

UNIT-IV

7. (a) Briefly explain the components of a drop spillway. Write its advantages, and limitations in soil and water conservation. 5+5=10

   (b) Calculate the value of wave free board for design a drop spillway, which has 4.5 m drop height and can handle the discharge rate 7.5%. Assume that the pool water at u/s end has 200m as fetch length. 4

8. Explain the phenomenon of a hydraulic jump in open channel flow. Discuss the energy loss associated with a hydraulic jump and provide practical applications where hydraulic jumps are effectively used in engineering. 4+10=14

UNIT-V

9. Explain the process of stream bank erosion. Discuss the natural and human-induced factors that contribute to it. What are the impacts of stream bank erosion on agricultural land, water quality, and ecosystems? 4+4+6=14

10. Describe various structural and vegetative measures used to control stream bank erosion. Support your answer with suitable diagrams and examples of real-world applications. 7+7=14

*****