M.Tech Even Semester Examination, May, 2025

Agricultural Engineering

(2nd Semester)

Course No: 4AG-153B

[Elective-III (Open Channel Hydraulics and Centrl 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. (a) Classify the open channel flow based on variation of flow parameters with time and space. **7**

   (b) Differentiate between open channel flow and pipe flow. 7

2. (a) Describe the open channel flow based on turbulence and concept of critical flow. 6

   (b) What do you mean by geometric elements of a channel section? And develop the formulae for geometric elements of a triangular and trapezoidal channel section. 2+6=8

UNIT-II

3. (a) Show that relation between the alternate depths in rectangular channel can be expressed as: 10

$$y_c^3 = \frac{2y_1^2 . y_2^2}{(y_1 + y_2)}$$

(b) Differentiate between steady flow and uniform flow. 4

4. (a) What is non uniform flow? Discuss the different type of non-uniform in details. 2+6=8

(b) Classify the open channel based on the shape and boundary characteristics. 6

UNIT-III

5. Write the short notes on:

I. Head

II. Hydraulic Jump

III. Super Critical flow

IV. Prismatic Channel

V. Alternate depths

VI. Specific Energy

VII. hydraulic drop 2×7= 14

6. (a) Show that the theoretical discharge, Q of open channel flow can be expressed as:

$$Q = A_2 \sqrt{\frac{2g\,(\Delta y - h_f)}{1 - \left(\frac{A_2}{A_1}\right)^2}}$$

A_1 and A_2 are cross-sectional area at upper head and lower head of channel respectively, Δy = difference between hydraulic heads, h_f = head loss due to friction, g = acceleration due to gravity. 10

(b) What is tide? Explain the causes of tides. 2+2=4

UNIT-IV

7. (a) Explain the formation and movement of ocean waves. What factors influence wave height and energy. 5+5=10

(b) How ocean water is different from fresh water? 4

8. Describe the major physical and chemical properties of ocean water. How do they vary with depth and location. 8+6=14

UNIT-V

9. (a) What is meant by coastal erosion? Explain the need for artificial protection of coastlines. 3+7=10

(b) Describe the causes of coastal erosion. 4

10. (a) Describe the various methods of artificial coastal protection. Which method do you think is the most effective and why? 4+3=7

(b) Discuss the advantages and disadvantages of using sea walls for protecting coastlines. 7

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