

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2015

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. (a) A straight rectangular channel is having a slope of 1 in 1000. The width is 1 m, and the depth of flow is 0.5 m. Velocity of flow is 1 m/s. Construct the hydraulic grade line between two sections 1 km apart. Will it be parallel to energy grade line ? Also give explanation for your answer. 7
- (b) A rectangular channel has a bottom width of 6.0 m and an 'n' value of 0.020. For $y_n = 1.0$ m and $Q = 11$ m³/s, find the normal slope. 7
2. (a) A rectangular channel expands smoothly from a width of 1.5 m to 3.0 m. At upstream of the expansion the depth of flow is 1.5 m and the velocity of flow is 2.0 m/s. Estimate the depth of flow after the expansion. 7

- (b) Establish the relationship between the sequent depths, and calculate the energy loss due to the formation of a hydraulic jump. 7
3. (a) Discuss the characteristics of water surface flow profiles. What are the bases of classification of flow profiles? 7
- (b) Discuss the use of specific energy and specific force curves in locating a jump. 7
4. (a) Discuss the direct integration method of computation of water surface profile. 7
- (b) A rectangular channel has a width of 2.0 m carrying a discharge of 5 cumecs with a depth of 1.25 m. At a certain section of the channel, a small smooth hump with a flat top and height of 0.10 m, is proposed to be built. What is the likely change in the water surface, neglecting any loss of energy? 7
5. (a) What is an ogee spillway? Outline the hydraulic design of an ogee spillway. Explain with suitable examples and sketches. 7
- (b) Explain the basic principle of analysis of a hydraulic bore. 7
6. (a) Determine the celerity and wavelength for a wave having a period of 9 seconds in water that is standing to a depth of 8 m. 7
- (b) List the assumptions and derive the dynamic equation of uniformly progressive flow. 7

7. (a) Explain theoretically the wave action on gravity dams. 7

(b) Discuss the wave action on shore structures. 7

8. Write short notes on the following : $4 \times 3 \frac{1}{2} = 14$

(a) Froude Number

(b) Hydraulic Jump

(c) Gradually Varied Flow

(d) Flow Transitions
