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ET-533(B)

00622

B.TECH. CIVIL (WATER RESOURCES ENGINEERING)

Term-End Examination

June, 2019

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 allowed.*

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1. (a) Derive an expression for determining the discharge passing through an open channel and state the assumptions made therein. **8**

(b) Give examples with neat sketches for a uniform, gradually varied, rapidly varied, spatially varied and unsteady flow. **6**

2. (a) Derive the relationship between Manning's and Chezy's constants. **6**

(b) A 3.6 m. wide rectangular channel carries water to a depth of 1.8 m. In order to measure the discharge, the channel width is reduced to 2.4 m. and a hump of 0.3 m. height is provided in the bottom. Calculate the discharge if water surface in the contracted section drops by 0.15 m. Assume no losses. **8**

3. (a) Discuss the conditions which may lead to the formation of surge waves in an open channel. **6**

(b) If y_1 and y_2 are alternate depths in a rectangular channel; show that **8**

$$\frac{2y_1^2\,y_2^2}{(y_1 + y_2)} = y_c^3$$ and hence the specific

energy, $$E = \frac{y_1^2 + y_1 y_2 + y_2^2}{y_1 + y_2}$$

Where all symbols carry usual meaning.

4. (a) The velocity distribution along a vertical in a channel can be expressed as $v/v_{max} = (y/y_0)^{1/n}$, where y_0 = depth of flow, v - velocity at any height, y = height above the bed and n - a constant. Find the values of α and β. **7**

(b) Explain how the phenomena of hydraulic jump formation and travel of a translatory wave in an open channel are inter-related. **7**

5. (a) Explain the following with examples : **2x3=6**

(i) Velocity distribution and pressure distribution.

(ii) Prismatic channel and non-prismatic channel.

(b) A rectangular channel has a width of 2.0 m. and carries a discharge 4.8 m^3/sec. with a depth of 1.6 m. At a certain section a small smooth hump with a flat top and of height 0.10 m. is proposed to be built. Calculate the likely change in the water surface. Neglect the energy loss. **8**

6. Explain the step wise procedure for computing of Gradually Varied Flow (GVF) by standard step method. Show the necessary figures and tables required for the computations. **14**

7. (a) Discuss wave celerity, length and period relationships with reference to wave propagation in an open channel. **5**

   (b) Find the critical depth for a specific energy of 2 m. in the following channels : **3x3=9**

   (i) Rectangular channel, B = 2 m.

   (ii) Triangular channel, m = 1.5.

   (iii) Trapezoidal channel, B = 2.0 m. and m = 1.0.