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ET-533(B)

B.Tech. Civil (Water Resources Engineering)
Term-End Examination
June, 2014

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***five*** *questions. All questions carry equal marks. Give neat and labelled sketches. Use of scientific calculator is permitted.*

1. (a) Discuss the Hydraulic and Energy Gradients with reference to (i) pipe flow and (ii) open channel flow, with figures. *6*

(b) Given a trapezoidal channel with the normal discharge of 73 m^3/s, side slopes of 1·5 : 1, a longitudinal slope of 0·0016 and n = 0·013. Determine the normal depth of flow for a bottom width of 3 m. *8*

2. (a) Draw specific energy curve and explain the significant locations in detail for the specific energy curve. *6*

(b) A rectangular channel expands smoothly from a width of 2 m to 4 m. Upstream of the expansion the depth of flow is 1·8 m, and the velocity of flow is 2·3 m/s. Estimate the depth of flow after the expansion. *8*

3. Discuss the assumptions of gradually varied flow (GVF). Prove that dynamic equation of GVF is given by : $\frac{dy}{dx} = \frac{S_o - S_f}{1 - \frac{Q^2 T}{gA^3}}$ *14*

4. (a) Define control section. Explain in detail the types of control sections. *4*

   (b) Discuss in detail the Bresse Method to compute gradually varied water surface profiles. *10*

5. (a) Define hydraulic jump. Discuss the application of hydraulic jump in detail. What are the assumptions made in the analysis of hydraulic jump ? *8*

   (b) In a hydraulic jump occurring in a horizontal rectangular channel, when the Froude number before the jump is 10·0 and the energy loss is 3·10 m, estimate the sequents depths. *6*

6. (a) Define Transitions. What are the functions of channel transitions ? Draw different channel transitions. *8*

   (b) Explain how we use the concept of specific force in the hydraulic jump predictions. *6*

7. Prove that (i) $R = \frac{y}{2}$ (ii) $R = \frac{y}{2\sqrt{2}}$ for efficient rectangular and triangular section of open channel respectively. *14*

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

(a) Isovels

(b) Factors influencing Manning's Coefficient 'n'

(c) Hydraulic exponent

(d) Hydrostatic pressure

(e) Velocity distribution in a rectangular channel