No. of Printed Pages : 4

ET-533(B)

B.Tech. Civil (Water Resources Engineering)

01915

Term-End Examination

June, 2010

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours *Maximum Marks : 70*

Note : Attempt any five questions. All questions carry equal marks. Support your answers with examples and neat diagrams, wherever necessary. Use of calculator is permitted. Assume appropriate data if not given.

1. (a) Explain each with one example : 6

   (i) Depth of flow and Stage

   (ii) Steady and Varied flow

   (iii) Velocity distribution and Pressure distribution at a section

   (b) Given a trapezoidal channel with a bottom width of 3.3 m, side slope of 1.5 : 1, a longitudinal slope of 0.0016 and an estimated value of n = 0.13, find the normal depth of flow at a discharge of 8 m^3/sec. 6

   (c) Why is a bed slope provided for an open channel ? 2

2. (a) A 3.6m wide rectangular channel carries water to a depth of 1.8 m. In order to measure the discharge, the channel width is reduced to 2.4m and a hump of 0.30m height is provided in the bottom. Calculate the discharge if water surface in the contracted section drops 0.15m. Assume no losses. **7**

(b) What is a specific energy curve ? Draw specific energy curve, and then derive an expressions for critical depth and critical velocity. **1+2+4=7**

3. (a) Obtain the dynamic equation of Gradually Varied Flow (G.V.F). Also mention the position of non-uniform flow depth with respect to the normal depth Y_0 and critical depth Y_c for a backwater curve and for a drawdown curve. **6+2=8**

(b) Using the basic differential equation of Gradually Varied Flow (G.V.F), show that dy/dx is positive for S_1, M_3 and S_3 profiles. **2x3=6**

4. Explain the step wise procedure for computing of Gradually Varied Flow (G.V.F) by Standard Step method. Show the necessary figures and tables required for the computation. **14**

5. (a) Discuss the circumstances which may lead to the formation of surge waves in open channel. 7

(b) A rectangular channel carries water at a depth of 2.0m and a velocity of 1.5m/s. Sudden opening of a gate at its upstream end causes a surge of depth 3.5m. Determine absolute velocity of surge and increased discharge. 7

6. (a) A rectangular channel has a width of 2.0m carrying a discharge of 5 m^3/s with a depth of 1.25m. At a certain section of the channel a small smooth hump, with a flat top and a height of 0.10m, is proposed to be built. What is the likely change in the water surface, neglecting any loss of energy ? 7

(b) Discuss Energy Dissipaters in a stilling basin. 7

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

(b) How is wave height estimated in a dam ? 7

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

(a) Hydraulic Jump

(b) Control section

(c) Dam break problem

(d) Momentum Principle

(e) Flow measurement

(f) Surges and their classification

(g) Morrison's equation and its significance

(h) Method of characteristics