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ET-533(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00690

June, 2016

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) Define the concept of an open channel flow and distinguish between pipe flow and open channel flow. Explain uniform flow. 7

(b) Given a trapezoidal channel with a bottom width of 3 m, side slopes of 1·5 : 1, and longitudinal slope of 0·0016 and n = 0·013, determine the normal discharge, if the normal depth of flow is 2·6 m. 7

2. (a) Water flows in a rectangular channel, 2·0 m wide, at a velocity of 2·8 m/s and at a depth of 2·2 m. There is an upward step of 0·72 m in the channel bed. What expansion in width must take place simultaneously for this flow to be possible as specified ? 7

(b) Water flows in a horizontal channel with a velocity of 8·0 m/s at a depth of 1·0 m. Find the conjugate depth and the energy loss in the jump. 7

3. (a) Enumerating the basic assumptions, derive the dynamic equation of gradually varied flow in an open channel. 7

(b) Trace the profile of a hydraulic drop and locate the hydraulic jump in an open channel. 7

4. (a) Explain the graphical integration method of computation of water surface profile in an open channel. 7

(b) Describe the salient features of standard step method, as applied to natural channels, to compute the flow profiles in a gradually varied flow. 7

5. (a) A discharge of 15 m^3/s flows with a depth of 1·5 m in a rectangular channel, 5 m wide. At a downstream section the width is reduced to 4·5 m and the channel bed is raised by 0·10 m. What will be the state of water surface elevations in the transitions ? 7

(b) Deduce the expressions for the energy dissipation at the toe of a spillway. 7

6. (a) Explain the phenomenon of surges in power canals with suitable sketches. 7

(b) Determine the wavelength and celerity for a wave whose period is given to be 12 seconds in a water body of depth equal to 30 m. 7

7. (a) Compute the shape of the wave profile by the integration of the dynamic equation. 7

(b) Explain the dynamic effect of wave action. 7

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

(a) Hydraulic Jump

(b) Flow Profiles

(c) Slotted Roller Bucket Type Energy Dissipator

(d) Energy Propagation