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ET-533(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00253

June, 2018

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of non-programmable scientific calculator is allowed.*

1. (a) Explain the velocity distribution in rectangular channel, triangular channel, trapezoidal channel and shallow ditch, with the help of neat diagrams. 7

(b) A straight rectangular channel is having a slope of 1 in 1000. The width is 1 m and 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 the energy grade line ? If so, why ? If not, why so ? 7

2. (a) Explain the concept of specific momentum/specific force with neat diagram in detail. 7

(b) After flowing over a spillway, a discharge of 4·2 m^3/s passes over a level concrete apron (n = 0·13). The velocity at the foot of the spillway is 12·5 m/s and tail water depth is 3·0 m. In order that the jump be contained on the apron, how long should it be built ? How much energy is lost from the foot of the spillway to the downstream end of jump ? 7

3. (a) Explain the method of direct integration (Bresse method). 7

(b) A trapezoidal channel of base width 6·0 m, and side slope z = 1·5 is laid on a bed slope of 0·001. It carries a discharge of 28 m^3/s. The channel terminates in a free overfall. Compute the free overfall. Compute the flow profile from the free overfall point to a section where depth of flow is 2% less than the normal depth by the direct step method. Take n = 0·025. 7

4. (a) Explain Chow's method for computation of water surface profile in detail. 7

(b) A trapezoidal channel having a bed width b = 7 m, side slope z = 2, bed slope S_0 = 0·0016 and Manning's n = 0·025 carries a discharge at 12·26 m^3/s. Compute the back water (Graphical integration) profile created by a dam which backs up the water to a depth of 2 m immediately behind the dam. The upstream end of the profile is assumed at a depth equal to 1% greater than the normal depth. Assume the energy coefficient = 1·0. 7

5. (a) Explain sub-critical flow with a hump with neat sketch. 7

(b) A venturi flume is 1·3 m wide at the entrance and 0·65 m at the throat. Neglecting hydraulic losses in the flume, compute the flow if the depths at the entrance and throat sections are 0·65 m and 0·60 m, respectively. A hump of height 20 cm is to be installed at the throat, so that a standing wave is formed beyond the throat. What will be the increase in upstream depth if the same flow passes through the flume ? 7

6. (a) Explain about negative surges in detail with the help of neat sketch. 7

(b) A tidal wave is observed to travel at a velocity of 10·0 m/s. The initial uniform flow depth is 3·0 m at a velocity of 2·0 m/s. Estimate the height, overrun, final velocity and discharge. 7

7. (a) Explain Dam Break Problem in detail. 7

(b) Enlist the factors that guide engineers in evaluating the wave force on structures and briefly explain them. 7

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

(a) Water hammer effect

(b) Froude number

(c) Gradually varied flow

(d) Control structures

(e) Parshall flume