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ET-540(B)

B.Tech. Civil (Construction Management)

Term-End Examination

June, 2012

ET-540(B) : FLOW IN OPEN CHANNEL

Time : 3 hours *Maximum Marks : 70*

Note : *Solve **any five** questions. All questions carry **equal** marks. Give neat and labelled sketches.*

1. (a) In a very mild slope why do we assume the vertical depth of flow to be equal to the depth of flow perpendicular to the bed. Explain with a sketch. 5

(b) A triangular section (with central angle = 60°) carries a flow at $y = 2$ m. Find the corresponding T (Top width). 7

(c) What do you understand by Z (section factor) of an open channel ? Explain it. 2

2. (a) A triangular open channel (with its central angle = 70°) has a bed slope of 0.0011, and $n = 0.015$. If a discharge of 55 m^3/s is to pass off, what would be its normal depth of flow ? Use trial and error method. 8

(b) A trapezoidal channel (b = 5m) has n = 0.016, and z = 1, and carries a flow of 10 m^3/s at a depth of 1.25 m. Determine the bed slope of the channel. 6

3. A rectangular channel expands smoothly from b=2.5 m to b=3.5 m. At the upstream end, the velocity of flow=1.95 m/s, for a depth of flow = 1.25 m. Determine the flow depth after the expansion for no loss of energy. Compute the upstream and downstream value of Fronde No. 14

4. (a) A horizontal, rectangular channel (b=2 m) sustains a flow of 1.0 m3/s, with its flow depth=0.17 m. Determine the down stream depth required to give rise to a hydraulic jump. Why should, at all a jump form in this channel ? 8

(b) Show that at a critical flow $V^2/2g = D/2$. 6

5. (a) Explain how to classify mild, steep, and critical slopes of a channel. Is a mild slope of a channel always so for all flows ? Explain. 4

(b) A steep channel carries a certain uniform flow; and a barrier on it distort's the flow profile. Sketch the G.V.F. that will form behind the barrier. Explain its behaviour at its two extremes with the help of G.V.F. equations. 4

(c) Find the critical slope of a rectangular channel ($b = 2$ m) for a discharge of $10 m^3/s/m$. Take $n = 0.015$. **6**

6. Discuss the flow characteristics of a very long channel, connecting two reservoirs, if the flow is subcritical and the downstream depth is held constant. **14**

7. Describe the use of specific energy and specific force curves in locating a jump in a steep channel. **14**

8. A trapezoidal channel ($b = 6m$, $z = 2$, $S_0 = 0.0014$, $n = 0.021$) carries a $Q = 10.0$ m3/s. A dam stands on it, which gives rise to a depth of flow behind itself $= 1.35m$. Take $\alpha = 1$, and compute x (w.r.t. dam) for a $y = 1.3m$ to exist, in one step. **14**