

B.Tech. Civil (Construction Management)

Term-End Examination

June, 2013

00174

ET-540(B) : FLOW IN OPEN CHANNEL

Time : 3-hours

Maximum Marks : 70

Note : Answer any five questions. Give neat sketches wherever required. Use of non programmable scientific calculator is permitted.

1. (a) Explain the principle of Hydraulic Jump creation in an open channel. How a jump can be interpreted by the specific energy and specific force curves. 3.5+3.5=7
- (b) In an open channel the supercritical depth y_1 is 0.02 m and subcritical depth $y_2=0.5m$ before and after the jump. The discharge Q in a horizontal rectangular channel of width 1.5m was $0.15m^3/s$. Determine if a well defined free jump will be formed? 7
2. (a) Establish the relationship between the Manning's coefficient 'n' and Chezey's Coefficient 'C'. What are the general conditions for Manning's coefficient 'n' being very close to Kutter's roughness coefficient? 3.5+3.5=7

- (b) What do you understand by the section factor for uniform flow computations? Can there be more than one discharge Q_n for maintaining a uniform flow? Discuss the conditions for normal slope S_n . 7
3. (a) What do you understand by Gradually Varied flow(G.V.F)? What are the basic assumptions in GVF. flow computation? Also, derive the general equation for G.V.F. computatios. 1+2+4=7
- (b) What do you understand by drawdown curve and backwater curve. For a channel, having a positive sustaining slope (S_o), what are the conditions at which (dy/dx) will be positive. Also, discuss various possible flow situations for positive (dy/dx) in a prismatic channel with G.V.F. conditions. 7
4. (a) Discuss the classification of flow profiles in a Gradually Varied Flow situation. 7
- (b) A long rectangular channel of 20.0 m width and a bed slope of 0.0015, connects two reservoirs of water. If depth at the upstream reservoir is 1.5m and at the downstream reservoir it is maintained at 2.1m what type of water surface is expected to form in the channel. Assume $n=0.016$. 7

5. (a) Illustrate the location of a Hydraulic Jump at a Junction of steep and mild channels. 4
- (b) A trapezoidal channel of base width 6 m and side slopes of 1:2 was laid on a normal bed slope (S_0) of 0.0016; it carries a discharge of $30\text{m}^3/\text{s}$. The channel roughness $n=0.025$. Compute the normal depth of flow. 10
6. (a) Explain the graphical integration method of water surface profile computation using a neat sketch. 7
- (b) A wide rectangular channel carries a discharge of $4\text{ m}^3/\text{s}$ per metre width of the channel on a bed slope of 0.001. The channel has a roughness coefficient $n=0.025$. Compute the flow profile from the weir site to an upstream section where depth of flow is 15% greater than the normal depth. 7
7. Write short notes on any four of the following :
- (a) H 3 profile 4x3.5=14
- (b) Critical flow condition
- (c) Velocity distribution in an irregular channel section.
- (d) Normal slop and Normal Depth
- (e) Froud Number
- (f) Super critical flow
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