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ET-540(B)

B.Tech. Civil (Construction Management)

Term-End Examination

00571

December, 2015

ET-540(B) : FLOW IN OPEN CHANNEL

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Provide labelled diagram wherever necessary. Use of scientific calculator is allowed.*

1. Write short notes on any ***seven*** of the following : *7×2=14*

(a) Wide rectangular channel

(b) CI Flow profile

(c) Alternate depth

(d) Reynolds Number

(e) Prismatic channels

(f) Gradually Varied Flow (G.V.F.)

(g) Flow regimes

(h) Specific force

(i) Normal slope

(j) The Chezy's coefficient 'C'

2. (a) What are the similarities and dissimilarities of the following flow profile computation methods : 7

(i) Bakhmeteff method

(ii) Chow's method

(iii) Standard stop method

(b) What do you understand by the Hydraulic Exponent of uniform flow computation ? Prove that

$$N = \frac{2y}{3A}\left(ST - 2R\frac{dP}{dy}\right).$$

All are standard notations used in open channel flow. 7

3. (a) What is modified Moody Diagram ? Describe the characteristics of Turbulent Region using this diagram. 7

(b) Find out the normal depth of flow for a discharge of 0·5 m^3/s in a circular culvert of 0·80 m diameter with Manning's coefficient of roughness n = 0·0016 and bed slope S = 0·0015. 7

4. (a) What are the common uses of Specific energy principle to flow situations ? Explain the Accessibility Problem with the help of a neat sketch. 7

(b) Define specific energy and specific force. Illustrate both curves for a parabolic section. 7

5. (a) In a horizontal rectangular channel of 1·5 m bottom width, determine whether a well-defined and free jump will be formed, if the flow in the channel is 1·5 m^3/s and $y_1 = 0{\cdot}015$ m and $y_2 = 0{\cdot}40$ m. 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

6. (a) Describe the direct stop method of profile computation in Gradually Varied Flow in a channel section which is prismatic in nature having a mild slope and rocky bed profile in a hilly watershed. What will happen to the flow in a steep drop situation ? 7

(b) How does a hydraulic jump set in a mild open channel ? Use a neat diagram to explain the development of M 3 profile in such a section. Also clearly specify the conditions leading to the same. 7

7. (a) What do you understand by Q-constant curve ? What is its applicability ? Discuss the following : 7

(i) C-curve

(ii) N-line

(iii) Z-line

(b) What is a control section ? What is the applicability of artificial control section in canal regulation structures ? 7

8. (a) In order to solve the problem of G.V.F. in prismatic and non-prismatic channels of any shape, which method is employed to compute the water surface profile ? Discuss in detail with the help of a diagram. *7*

(b) Prove that for a wide rectangular channel ($R \simeq y$) the G.V.F. profile can be expressed as

$$dx = \frac{y_n}{S_o}\left[1-\left\{1-\left(\frac{y_c}{y_n}\right)^3\right\}\frac{1}{1-u^3}\right]du,$$

using the direct integration or BRESSE method. *7*