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ET-533(B)

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B.TECH. CIVIL (WATER RESOURCES ENGINEERING)

Term-End Examination

December, 2013

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. All question carry equal marks. Give neat and levelled sketches. Use of scientific calculator is permitted.*

1. (a) Write the applications of the principles of open channel flow in detail. 4

(b) Define following geometrical parameters of a channel : 4

(i) Top width

(ii) Wetted Area

(iii) Wetted Perimeter

(iv) Hydraulic Radius

(c) The discharge of water through a rectangular channel of width 8m, is $10m^3/s$ when depth of flow of water is 1.2 m. Calculate : 6

(i) Critical depth

(ii) Critical velocity

(iii) Minimum specific energy

2. (a) Write the difference between the following 4

(i) Prismatic and Non prismatic channels.

(ii) Natural and Artificial channel.

(b) Define the terms : 3

(i) Subcritical flow

(ii) Critical flow and

(iii) Super critical flow

(c) A 2m wide rectangular channel has a specific energy of 1.50 m, when carrying a discharge of $5m^3/s$. Calculate alternate depth and corresponding Froude numbers. 7

3. (a) Discuss the salient features of the surface profile in detail. Draw different Gradually Varied flow profiles. 8

(b) What is back water curve ? Draw the figure for back water curve and afflux. 6

4. What are the methods of computation of water surface profile ? Explain the Graphical Integration Method in detail with suitable sketches. 14

5. (a) Prove the Belanger momentum equation 10

$$\frac{y_2}{y_1} = \frac{1}{2}\left(-1 + \sqrt{1 + 8F_1^2}\right)$$

for hydraulic jump in horizontal rectangular channel.

(b) Classify the hydraulic jump basis of location of jump. 4

6. (a) Define Transition. What are the function of channel transitions ? Draw different channel transition. 8

(b) Give typical velocity distribution profile in an open channel (prismatic) along a vertical and along a horizontal. 6

7. (a) Derive the condition $\frac{Q^2}{g} = \frac{Ac^3}{Tc}$ 8

for maximum discharge.

(b) A trapezoidal channel is 11.0 m wide and has a side slope of 1.4 horizontal: 1 vertical. The channel is lined with smooth concrete of n = 0.012. Find the bottom slope necessary to carry only $48 m^3/sec$ of discharge at a depth of 3.0 m. 6

8. Write short notes on ***any four*** of the following : **4x3.5=14**

(a) Hydraulic exponent

(b) Specific energy curve

(c) Mean velocity of flow

(d) Major difference between open channel and a pipe flow

(e) Length of hydraulic jump