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ET-533(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2017

00877

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) A straight wide river has a constant depth of flow of 1 m at all its sections. A flood wave enters the river increasing the depth to 6 m at upstream, and to 5 m at downstream locations. Classify this type of flow. *7*

(b) A rectangular channel has a bottom width of 8·0 m and n = 0·015.

(i) For y_n = 1·0 m and Q = 15 m^3/s, find the normal slope.

(ii) Find the normal depth of flow for Q = 15 m^3/s. *7*

2. (a) Explain the specific energy curve with the help of a neat diagram. Write the specific energy equation and derive the Froude number. *8*

(b) Water flows in a rectangular channel 2·5 m wide at a velocity of 2·8 m/s and a depth of 2·2 m. There is an upward step of 0·72 m in the channel bed. What expansion in width must take place simultaneously for this flow to be possible as specified ? *6*

3. (a) Derive an expression for energy loss due to formation of hydraulic jump. *7*

(b) A hydraulic jump occurs in a rectangular channel and depths of flow before and after the jump are 0·5 m and 2·0 m respectively. Calculate the critical depth and the power lost per unit width of the channel. *7*

4. (a) Derive an expression for a gradually varied flow equation with a neat diagram. *10*

(b) A rectangular channel 4·5 m wide having a bed slope of 0·00009 carries water at a depth of 1·4 m. If the channel terminates in an abrupt drop in the bed, what type of flow profile, upstream of the drop, is expected to form ? Assume n = 0·016. *4*

5. Explain gradually varied flow profiles under practical conditions in detail. *14*

6. (a) Explain all three metering flumes for flow measurement in brief. *7*

(b) A rectangular channel 3 m wide carries a discharge of 1·85 cumecs with a depth of flow 0·50 m. It is to cross a natural drainage and, for this purpose, find out the maximum allowable contraction in the width without increasing the depth of flow in the channel. 7

7. (a) List the assumptions and derive the dynamic equation of uniformly progressive flow. 7

(b) What is the deep-water wavelength and the corresponding phase velocity if a waveform has a period of 7 seconds ? What will be its wavelength if the depth of water is 30 m ? 7

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

(a) Choking Condition

(b) Specific Force and Sequent Depth

(c) Hydraulic Bore

(d) Specific Force

(e) H-Profile