No. of Printed Pages : 3 **ET-533(B)**

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

June, 2017

00375

ET-533(B) : OPEN CHANNEL FLOW

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. (a) Derive the Chezy's equation for uniform flow using the Momentum equation with the help of a neat sketch. *6*

(b) A trapezoidal channel is 10·0 m wide and has a side slope of 1·5 horizontal to 1 vertical. The bed slope is 0·0003. The channel is lined with smooth concrete of n = 0·012. Compute the mean velocity and discharge for the depth of flow of 3·0 m. *8*

2. (a) Derive the equation of critical depth in a rectangular channel with bottom width B and depth of flow Y. *6*

(b) Calculate the bottom width of a channel required to carry a discharge of 15·0 m^3/sec as a critical flow at a depth of 1·2 m. If the channel cross-section is rectangular, find the specific energy of the channel flow. *8*

3. (a) Classify the various types of Gradually Varied Flow (GVF) profiles with the help of neat sketches for Zone I only. *7*

(b) In a hydraulically efficient channel cross-section of trapezoidal shape, prove that R = D/2, where D is characteristic length and R is hydraulic mean radius. *7*

4. The width of a rectangular channel is 3·5 m and it conveys a discharge of 15·0 m^3/sec at a depth of 2·0 m. It is proposed to reduce the width of the channel at a hydraulic structure. Assuming the transition to be horizontal and the flow to be frictionless, determine the water surface elevation upstream and downstream of the construction with the constructed width of 2·50 m. *14*

5. (a) Derive the equation for normal depth (Y_0) in the open channel of trapezoidal shape. *6*

(b) Discuss and derive the general equation for wave velocity in surges. *8*

6. A tidal bore is observed to travel at a velocity of 10·0 m/sec. The initial uniform flow depth is 3·0 m at a velocity of 2·0 m/sec. Estimate the height, overrun, final velocity and discharge. *14*

7. List the various assumptions of first order wave theory. Derive the differential equation of motion for progressive wave. *14*

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

(a) Dynamic Effect of Wave Action

(b) Dam Break Problems

(c) Design Criteria of Solid Roller Bucket

(d) Energy Dissipation in Spillways

(e) Specific Force

(f) Flow Regimes