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ET-540(B)(S)

B.Tech. Civil (Construction Management)

Term-End Examination

0428

December, 2016

ET-540(B)(S) : FLOW IN OPEN CHANNEL

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume suitable data, if not given.*

1. (a) Define Reynolds number and Froude number. How do these numbers help in the classification of flow through pipes/open channels ? *8*

(b) Differentiate between the following : *2×3=6*

(i) Hydraulic gradient and Energy head

(ii) Gradually varied flow and Rapidly varied flow

2. (a) Draw the isovels for the following channel sections : *3×2=6*

(i) Triangular channel

(ii) Narrow rectangular channel

(iii) Natural irregular channel

(b) Determine the normal discharge through a trapezoidal channel for the following data : *8*

Normal depth of flow = 2 m

Bottom width of channel section = 3 m

side slope = 1·5 : 1

Longitudinal slope = 0·0016

n = 0·013

3. (a) Draw a typical specific energy curve for open channel flow and explain its salient features. *7*

(b) A 2·5 m wide rectangular channel has a specific energy of 1·5 m when carrying a discharge of 6·5 m^3/s. Determine the alternate depths and corresponding Froude numbers. *7*

4. (a) Prove that, in a horizontal rectangular channel, energy loss (E_L) in a hydraulic jump is

$$E_L = \frac{(y_2 - y_1)^3}{4y_1y_2}.$$ 7

(b) A hydraulic jump occurs in a rectangular channel of 3·0 m width having a discharge of 7·8 m^3/s. The depth of flow before the jump is 0·28 m. Determine (i) the sequent depth, and (ii) the energy loss in the jump. 7

5. (a) Discuss the assumptions made in the theory of gradually varied flow. 7

(b) A rectangular channel 4·0 m wide having a bed slope of 9×10^{-5} carries water at a depth of 1·3 m. If the channel terminates in an abrupt drop in the bed, what type of flow profile, upstream of drop, is expected to form ? Assume n = 0·016. 7

6. In a rectangular channel, two reaches M and N are in series, with reach M being upstream of reach N. These channel reaches have the following characteristics :

Reach	Bed Width (m)	Slope	Normal Depth of Flow
M	5·0	0·0004	3·036
N	4·0	0·0003	2·902

The discharge in the channel is 15·0 m^3/s.

Identify and sketch the resulting gradually varied flow (GVF) profile due to change in channel characteristics as shown in the table above. *14*

7. (a) Describe in brief, the Bakhmeteff method of computation of water surface profile. *7*

(b) Discuss the graphical integration method of computation of water surface profile. *7*