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APR-MAY

B. E. (Eighth Semester) Examination, 2020

(New Scheme)

(Civil Engg. Branch)

OPEN CHANNEL FLOW

(Professional Elective)

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt any* ***three*** *parts of each question. Part (a) is compulsory.*

Unit-I

1. (a) Identify the type of flow for the following : 2

(i) A flood wave while passing down a river section

protected by embankments, spills over the embankment at certain locations

(ii) Sudden opening of sluice gate

(b) At a section in a channel expansion the velocity over a quarter of the cross section is zero and is uniform over the remaining three-fourths of the area. Find average velocity, kinetic energy correction factor and momentum energy correction factor. 7

(c) A trapezoidal channel is 5·0 m wide and has a side slope of 0·5 horizontal : 1 vertical. Find the depth of flow which can make the channel on efficient section. If S_0 = 0·0002 and n = 0·02, find the corresponding discharge. 7

(d) Explain the term conveyance and second hydraulic exponent clearly and find out an approximate expression for second hydraulic exponent. 7

Unit-II

2. (a) A triangular channel with an apex angle of 60° has a critical depth of 0·25 m. The discharge in the channel is ..... m^3/s. 2

(b) Water flows in a 3·0 m wide rectangular channel at a velocity of 2·5 m/s and a depth of 1·8 m. If at a section these is a smooth upward step of 0·30 m. What width is needed at that section to enable the critical flow to occur on the hump without any change in the upstream depth. 7

(c) The alternate depths for a certain flow in a rectangular channel are 0·7 m and 3·0 m respectively. Estimate the critical depth for the flow in a channel. 7

(d) Discuss the transition in canal due to width contraction for super critical flow. 7

Unit-III

3. (a) A rectangular channel has $B = 20$ m, $n = 0{\cdot}020$ and $S_0 = 0{\cdot}0004$. If the normal depth is 1·0 m, a depth of 0·8 m in a GVF in this channel is a part of ..... GVF profile. 2

(b) A 3·0 m wide rectangular channel has a longitudinal slope of 150 mm/km and Manning's $n = 0{\cdot}02$. When the discharge in the channel is 0·85 m^3/s estimate the slope of the water surface in the channel (relative to the horizontal) at a point where the depth of flow is 0·75 m. 7

(c) Sketch the GVF profiles produced on the following break in grade : 7

(i) Mild to steep

(ii) Steep to mild

(iii) Mildes to mild

(d) Describe the method of direct integration of GVF differential equation for GVF computations. 7

Unit-IV

4. (a) Define strong jump in a rectangular channel. 2

(b) In a 3·0 m wide horizontal, rectangular channel, a hydraulic jump takes place with initial Froude number of 10·25. The sequent depth ratio of the jump is 14·0. Estimate (a) the relative energy loss (b) Froude number of flow exiting the jump. 7

(c) Discuss the following sections for jump in horizontal non rectangular channel : 7

(i) Basic equation

(ii) Sequent depth ratio

(d) Describe the case of positive surge moving upstream. 7

Unit-V

5. (a) Define unsteady and steady spatially varied flow with example. 2

(b) Write short notes on : (any **four**) $4 \times 3\frac{1}{2} = 14$

(i) Differential equation of SVF with increasing discharge

(ii) Classification of SVF with increasing discharge

(iii) Profile computation of SVF with increasing discharge

(iv) Side weir

(v) Control point of SVF with increasing discharge