M. Tech.-II (Civil-Hydraulic Engineering) (CBCS – 2015 Course) : Winter-2018

SUBJECT: OPEN CHANNEL FLOW

Day: Thursday
Date: 22/11/2018

Time: 11.00 AM TO 02.00 PM
Max. Marks: 60

W-2018-3134

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answer to both the sections should be written in **SEPARATE** answer books.
4) Draw neat and labeled diagram **WHEREVER** necessary.
5) Use non-programmable **CALCULATOR** is allowed.

SECTION-I

Q. 1 **a)** Write a short note on velocity distribution in open channel flow. **(5)**

b) Derive the differential from of continuity equation in open channel flow. **(5)**

OR

a) Explain with sketch gradually varied flow, rapidly varied flow and spatially varied flow. **(5)**

b) What is hydraulically efficient channel section? **(5)**

Q.2 **a)** State resistance laws and their limitations. **(5)**

b) Explain: **(5)**

i) Conveyance
ii) Section factor
iii) Normal depth.

OR

a) What is equivalent roughness and explain flow it is determined. **(5)**

b) A trapezoidal channel 3 m wide with side slopes included at 30^{o} with horizontal carries a discharge of 10 m^3/sec to a depth of 1.5 m under uniform flow condition. The longitudinal slope of the channel bed is 0.0001. Compute the average shear stress in N/m^2 on the boundary. Also compute Manning's value. **(5)**

Q.3 **a)** Explain with neat sketch the specific force diagram. **(5)**

b) If Fr_1 and Fr_2 are Froude numbers corresponding to alternate depths y_1 and y_2 at certain discharge through a rectangular channel, show that **(5)**

$$\frac{y_1}{y_2}=\left[\frac{F_{r2}}{F_{r1}}\right]^{2/3}=\frac{2+F_{r2}^2}{2+F_{r1}^2}$$

OR

a) Define : **(4)**

i) Specific energy
ii) Specific force
iii) Critical depth
iv) Alternate depths

b) Show that the relation between the alternate depth y_1 and y_2 in a rectangular channel can be expressed as: **(6)**

$$\frac{2y_1^2y_2^2}{(y_1+y_2)}=y_c^3$$

P.T.O.

SECTION-II

Q.4 **a)** What are the assumptions involved in the analysis of GVF. Derive the differential equation of GVF in open channel flow. **(6)**

b) Sketch profiles on steep slope. Give examples. **(4)**

OR

a) Explain Ven-Te-Clow method of computation of gradually varied flow profile. **(6)**

b) List the gradually varied flow profiles which are possible . **(4)**

Q.5 **a)** Define hydraulic jump. State the assumption in theory of hydraulic jump. **(5)**

b) Draw a expression for loss of energy in hydraulic. **(5)**

OR

a) Discuss the classification of hydraulic jump. **(5)**

b) A rectangular channel carrying a super critical stream is to be provided with a hydraulic jump type of energy dissipater. It is derived to have an energy loss of 5.0 m in the jump when the inlet Froude number is 8.5. Determine the sequent depths. **(5)**

Q.6 Explain the basic principle of method of characteristics for solution of St. Venant's equations. **(6)**

OR

Explain the terms: **(4)**

i) Celerity
ii) Surges
iii) Positive surge
iv) Negative surge

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