M. TECH.-II (CIVIL-HYDRAULIC ENGINEERING) (CBCS – 2015 COURSE) : WINTER - 2017

SUBJECT: OPEN CHANNEL FLOW

Day: Wednesday
Date: 29/11/2017

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

W-2017-2802

N.B:

1) All questions are **COMPULSORY.**
2) Both the sections should be written in **SEPARATE** answer books.
3) Figures to the **RIGHT** indicate full marks.
4) Draw neat labeled diagrams **WHEREVER** necessary.
5) Assume suitable data, if necessary.

SECTION-I

Q.1 **a)** Derive the differential form of continuity equation in open channel flow. **(05)**

b) Explain the basic difference between open channel flow and closed conduit flow. Draw sketches also. **(05)**

OR

Q.1 **a)** Explain classification of open channel flow. **(06)**

b) What is momentum correction coefficient? Explain its importance in dealing with open channel flow. **(04)**

Q.2 **a)** State the factors affecting the Maming's n. What is equivalent roughness and explain how it is determined. **(05)**

b) A rectangular channel of 2 m width and 0.0025 bottom slope carries 1 m^3/s discharge of water at a depth of 0.45 m. Determine average velocity of flow, Manning's n and Chezy's constant C. **(05)**

OR

Q.2 **a)** Derive Chezy's equation for uniform flow in an open channel. State assumption made in it. **(06)**

b) Define: i) Normal depth ii) Section factor iii) Conveyance iv) Uniform flow **(04)**

Q.3 **a)** What is critical depth? With usual notations prove that in case of rectangular channel. $y_c = 3\sqrt{\frac{q^2}{g}}$ **(05)**

b) Explain with neat sketch specific force. **(05)**

OR

Q.3 **a)** Define specific energy. Show that for a given discharge, the specific energy in a channel is minimum for critical flow. **(06)**

b) Show that for critical flow to occur in the channel the velocity head should be equal to half the hydraulic depth. **(04)**

P.T.O.

SECTION-II

Q.4 Explain with sketches the profiles on the steep slope. Give examples. **(10)**

OR

Q.4 Starting from the basic principles, derive an expression of GVF for a wide rectangular channel in the form. **(10)**

$$\frac{dy}{dx} = S_0 \frac{1-(y_n/y)^{10/3}}{1-\left(\frac{y_c}{y}\right)^3}$$

Q.5 **a)** Derive the relation between sequent depths y_1 *and* y_2 in a hydraulic jump. **(06)**

b) Define: i) Sequent depths ii) Hydraulic jump **(04)**

OR

Q.5 Starting from the first principles derive expression for loss of energy in a hydraulic jump $\Delta E = \frac{(y_2 - y_1)^3}{4 y_1 y_2}$ **(10)**

Q.6 **a)** Explain the terms i) Celerity ii) Surges **(05)**

b) What are St. Venant's equations? List out assumptions used for derivation of St. Venant's equations. **(05)**

OR

Q.6 Describe the basic principle of method of characteristics. **(10)**

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