53 (CE 714) OCRL

2019

OPEN CHANNEL FLOW

Paper : CE 714

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. Write short notes on : 5×4=20

   (a) Types of channels

   (b) Classification of open-channel flow

   (c) Types of hydraulic jump

   (d) Classification of flow profiles.

Contd.

2. *(a)* Identify and sketch the GVF profiles in three mild slopes which could be described as mild, steeper mild and milder. The three slopes are in series. The last slope has a sluice gate in the middle of the reach and the downstream end of the channel has a free overfall. 10

(b) The velocity distribution in a rectangular channel of width B and depth of flow y_0 was approximated as $v = k_1\sqrt{y}$ in which k_1 is constant. Calculate average velocity for the cross-section and correction coefficients α and β. 10

3. *(a)* A $3{\cdot}0m$ wide rectangular channel has a flow of $3{\cdot}6m^3/s$ with a velocity of $0{\cdot}9m/s$. If a sudden release of additional flow at the upstream end of the channel causes the depth to rise by 50%, determine the absolute velocity of the resulting surge and the net flow rate. 10

(b) Derive the momentum equation of St. Venant Equation. 10

4. *(a)* Derive the differential equation of gradually varied flow. 10

(b) Explain the depth of flow for the channel transitions (a) with hump (b) with increased width of channel. 10

5. *(a)* Calculate the bottom width of a channel with discharge of $15m^3/s$ and critical depth of $1{\cdot}2m$. (a) Rectangular (b) Trapezoidal, $m = 1{\cdot}5$. 10

(b) A $2{\cdot}5m$ wide rectangular channel has a specific energy of $1{\cdot}5m$ and discharge of $6{\cdot}48m^3/s$. Calculate alternate depth and corresponding Froude Numbers. 10

6. For hydraulic jump in rectangular channel, derive the equation for sequent depth ratio and energy loss. 20