Total number of printed pages:2

PG/1st/PCEW102

2021

OPEN CHANNEL FLOW

Full Marks: 100

Time: Three hours

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

*Answer **any five** questions.*

1. a) If y_1 and y_2 are alternate depths in a rectangular channel and y_c is critical depth then show that 10

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

b) In a rectangular channel F_1 and F_2 are the Froude numbers corresponding to alternate depths of a certain discharge. Show that 10

$$\left(\frac{F_2}{F_1}\right)^{2/3} = \frac{2+F_2^2}{2+F_1^2}$$

2 a) The velocity distribution of a rectangular channel of width B and depth of flow y was approximated as $v=ky^{5/3}$ in which k is constant. Calculate the average velocity for the cross section and the correction coefficients α and β. 10

b) Derive the condition for critical flow. Also derive the equation for minimum specific energy for the rectangular section and trapezoidal section. 10

3 What are the 12 water surface profiles exist in gradually varied flow. Sketch them with real life examples. 20

4 Write short notes on: 4 x 5=20

a) Types of Channels

b) Types of hydraulic Jump

c) Classification of flow profiles

d) Classification of flow in open channel.

5 Sketch the possible GVF profiles in the following serial arrangement of channels and control. The flow is from left to right: 4 x 5=20

(a) mild – sluice gate– horizontal – steep – sudden drop

(b) steep–mild – milder slope– steeper

(c) steep – steeper– sluice gate – mild – sudden drop

(d) sluice gate – adverse– steep slope – horizontal

6 a) A rectangular channel carries a flow with a velocity of 0.85 m/s and depth of 1.90 m. If the discharge is abruptly increased threefold by a sudden lifting of a gate on the upstream, estimate the velocity and the height of the resulting surge. 10

b) In a tidal river the depth and velocity of flow are 0.9 m and 1.25 m/s respectively. Due to tidal action a tidal bore of height 1.4 m is observed to travel upstream. Estimate the height and speed of the bore and the speed of flow after the passage of the bore 10