2024

OPEN CHANNEL FLOWS

Full Marks : 100

Time : Three hours

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

*Answer **all** questions.*

1. Write in details of the following: 4 x 5=20

    a) Water hammer

    b) Hydraulic Jump

    c) Terminal fall velocity

    d) Differences of velocity distribution between pipe flows and open channel flows.

2. Derive the governing dynamic equation for Gradually varied flow. Draw the necessary figure and assume the necessary.   20

3. If y_1 *and* y_2 are alternate depth in a rectangular channel then show that   20

$$y_c^3 = \frac{2y_1^2 y_2^2}{(y_1+y_2)} \text{ and specific energy } E = \frac{y_1^2+y_1 y_2+y_2^2}{(y_1+y_2)}$$

4. In a 4.0 m wide rectangular channel (n = 0.017) the bed slope is 0.0006. When the channel is conveying 10.0 m³/s of flow, estimate the nature of gradually varied flow profiles at two far away section M & N in this channel where depth of flow is measured as 1.6 m and 2.1 m respectively.   20

5. a) Find the diameter of a circular sewer pipe which is laid at a slope of 1 in 8000 and carries a discharge of 800 litres/s when flowing half full. Take the value of Manning's n = 0.020.   10

    b) Write in details about Nikuradse's equivalent roughness.   10