Total number of printed pages: **02**

UG/7th/UCE717

2023

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 a short notes on the following 5*2 = 10
   a) Specific force
   b) Differences of velocity distribution between pipe flows and open channel flows.

2. If y_1 *and* y_2 are alternate depth in a rectangular channel then show that 10

$$y_c^3 = \frac{2y_1^2 y_2^2}{(y_1+y_2)} \text{ and specific energy } E = \frac{y_1^2+y_1y_2+y_2^2}{(y_1+y_2)}$$

3. Find the bed slope of trapezoidal channel of bed width 6 m, depth of water 3 m and side slope of 3 horizontal to 4 vertical when the discharge through the channel is 30 m^3/s. Take Chezy's constant as 70. 10

4. Write a short notes on the following 5*2 = 10
   a) Nikuradse's equivalent roughness
   b) Shield's diagram

5. a) Derive the governing dynamic equation for Gradually varied flow. Draw the necessary figure and assume the necessary. 15
   b) Write a short note on brink depth of open channel flows. 5

6. In a 4.0 m wide rectangular channel (n = 0.017) the bed slope is 0.0006. When the channel is conveying 10.0 m^3/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. 15

7. A rectangular channel carrying a supercritical stream is to be provide with a hydraulic jump type of energy dissipater. It is desired to have an energy loss of 5.0 m in the hydraulic jump when the inlet Froude number is 8.5. What are the sequent depth of this jump? 15

8. A 2.0 m wide rectangular channel has a discharge of 0.350 m^3/s. Find the height of a rectangular weir spanning the full width of the channel that can be used to pass this discharge while maintaining an upstream depth of 8.50 m. 10