

SECTION-B

2. Give classification of surface profiles.
3. A 3.6m wide rectangular channel carries water to a depth of 1.8m. In order to measure the discharge, the channel width is reduced to 2.4m and a hump of 0.3m height is provided in the bottom. Calculate the discharge if water surface in the contracted section drops by 0.15m. Assume no losses.
4. Explain why drag coefficient and hence drag of a sphere in subsonic flow is suddenly decreased as the flow velocities are increased beyond a certain point.
5. Explain different types of hydraulic jumps along with neat sketches.
6. Prove that for hydraulically most efficient rectangular channel, the width should be two times the depth of flow, so that the hydraulic radius is equal to half the depth of flow.

SECTION-C

7. What conditions are necessary for formation of a hydraulic jump? What are the elements and characteristics of hydraulic jump?
8. The normal depth of flow of water, in a rectangular channel 1.5m wide, is 1m. The bed slope of the channel is 0.0006 and Manning's roughness coefficient $n=0.012$. Find the critical depth. At a certain section of the same channel the depth is 0.92m while at a second section the depth is 0.86m. Find the distance between the two sections (use one reach in the calculations). Also find whether the section is located downstream or upstream with respect to the first section.
9. A hydraulically efficient trapezoidal channel has side slopes of 1:1. It is required to discharge $14\text{m}^3/\text{s}$ with a gradient (channel slope) of 1 in 1000. If unlined, the value of Chezy's C is 45. If lined with concrete, the value is 70. If the cost per m^3 of excavation is three times the cost per m^3 of lining, will the lined or unlined channel be cheaper.

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