Objective type questions

1. Under which of the following conditions steady non-uniform flow in open channels occurs?
   a. When for a constant discharge the liquid depth in the channel varies along its length
   b. When a constant discharge flows at the constant depth
   c. When a constant discharge flows in a channel laid at a fixed slope
   d. When the discharge and the depth both vary along the channel length

2. When the depth of flow changes gradually over a length of the channel, then the flow will be termed as
   a. Rapidly varied flow
   b. Critical flow
   c. Gradually varied flow
   d. Uniform flow

3. Non-uniform flow may caused by
   a. The change in width, depth, bed slope etc. of the channel
   b. An obstruction, across a channel of uniform width
   c. None of the above.
   d. Both (a) and (b)

4. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to slowly flowing stream causing a distinct rise of liquid surface, is
   a. Uniform flow
   b. Critical discharge
   c. Hydraulic jump
   d. None of the above

5. The channel whose boundary is not deformable is known as

   a. Rigid channel
   b. Prismatic channel
   c. Mobile channel
   d. Boundary channel

Answers:-

1 (a)   2 (c)   3(d)   4(c)   5(a)
Subjective questions:-

1   What is the difference between open channel flow and pipe flow.

2   Distinguish between:

        a. Steady and Uniform flow

        b. Unsteady and non-uniform flow

        c. Gradually and Spatially varied flow

        d. Critical and Super critical flows

        e. Prismatic and non-prismatic channel.

3   Define specific energy. Draw a neat sketch of specific energy curve for a rectangular channel showing all the details.

4   Write a short note on velocity distribution in a open channel.

5   What do you mean by critical flow? Derive the equation for the critical depth in triangular and rectangular channels.

6   Find at the discharge in a trapezoidal channel with a bed width of 10m, side slope of 1:1 and depth of flow of 2.0m under uniform flow condition. The bottom slope of 0.0001 and n=0.02. Also, find the Chezy's coefficient at this depth. (*Ans. 16 cumec, 52.4 m$^{1/2}$/s*)

7   A rectangular channel has a bed width of 4m, bottom slope of 0.0004 and Manning's n of 0.02. The normal depth of flow in this channel is 2m. If the channel empties into a pool at the downstream and the pool elevation of 0.6m higher than canal bed elevation at the downstream end. Calculate the critical depth of section. (*Ans. 0.742 m*)

8   Find the critical depth and critical velocity of the water flowing through a rectangular channel of width 8m, when discharge is 20cumecs. (*Ans 2.9 m/s*)

9   For a given triangular channel, section of side slope 2H: 1V, minimum specific energy is 1.5m. Find the corresponding critical velocity. (*Ans. 2.426 m/s*)

10   The discharge of water through a rectangular channel of width 6m is 18 cumecs, when depth of flow of water is 2m. Calculate,

        1. Specific energy of flowing water

        2. Critical depth and critical velocity

        3. Value of minimum specific energy.

    (Ans. 2.115m, 0.9716m and 1.457m respectively)

11   A lined channel of trapezoidal section carries a discharge of 10 cumecs, at a depth of

1.2m, with bottom width 2m and side slope of 1.5 Horizontal to 1Vertical. Consider uniform flow and calculate:

   a.   The longitudinal slope of the channel.

   b.   The average shear stress over the wetted perimeter

   c.   The value of equivalent Darcy's f .

   d.   The Froude number of flow. Assume, Manning's n= 0.010.

(Ans. 1/1351.4, 5.22N/m^2, 0.008, 0.776)

12   A rectangular channel 4m wide and bed slope 1 in 5000, conveys a discharge of 5.0 cumecs. The depth of flow at a section is 0.80m. How far upstream will the depth of flow be 1.0m? Assume N=0.012. *(Ans. 461.53m)*

13   For a constant specific energy of 1.0 N-m/N, calculate the maximum discharge that may occur in a rectangular channel, 1.0m wide. *(Ans. 2.91cumec)*

14   A trapezoidal channel has a bottom width of 6m and side slope of 1:1. The depth of the flow is 1.5m; bottom slope is 1 in 1000 and discharge of 15cumec flows through it. Determine the specific energy. Take n=0.015. (*Ans. 1.663m*).

References:-

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