B. TECH
(SEM VII) THEORY EXAMINATION 2019-20
OPEN CHANNEL FLOW

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 10 = 20**

a.   What do you mean by following?
        a. Undulating jump
        b. Weak jump
b.   Write a short note on hydraulic jump as an energy dissipater.
c.   Explain the terms normal depth and critical depth in relation to open channel flow. Under what circumstances are these depths identical?
d.   Define the terms: (i) Afflux, and (ii) Back water curve.
e.   What do you mean by uniform flow? What are the characteristics of uniform flow?
f.   Enlist the factors affecting the Manning's roughness coefficient.
g.   What is the difference between open channel flow and pipe flow?
h.   Write a short note on velocity distribution in an open channel.
i.   What do you mean by sudden transition in an open channel explain with sketch
j.   Distinguish between Prismatic and non-prismatic channel.

SECTION B

2.   **Attempt any *three* of the following:**   **10x3=30**

a.   Water flows in a channel at a velocity 2 m/s and at a depth 2.5 m calculate the specific energy
b.   What do you mean by critical flow? Derive the equation for the critical depth in Triangular and rectangular channels.
c.   A channel of trapezoidal section has a bottom width of 5m, one side is sloping at 400 with the vertical and the other has a slope of 1V to 2H. If the depth of flow is 1.5m, find the bed slope required to discharge 35 cumecs. Taking Manning's n = 0.017.
d.   An open channel has a cross section semicircular at the bottom with vertical sides and is 1.2m wide. It is laid at a bed slope of 0.375m per km. Calculate the values of chezy's C and Manning's n, if the depth of flow is 1.2m while the discharge is 0.85 m3 /s
e.   Show that for a hydraulic jump in a horizontal rectangular channel, the alternate depths are related by the expression:

$$y_2 = \frac{y_1}{2}\left[\sqrt{8F_1^2 + 1} - 1\right]$$ (with usual notations)

SECTION C

3.   **Attempt any *one* part of the following:**   **10x1=10**

a.   If a culvert is to be built across a subcritical stream, from the consideration of mechanics of flow, what factors govern the shape of the bridge piers, span and Shape of abutments? Which of these factors will be different in supercritical Flow?
b.   A triangular channel with an apex angle of 90° carries a flow of 0.7cumec at a depth of 0.6m. If bed slope is 1 in 100. Find the Manning's roughness of channel.

4.   Attempt any *one* part of the following: **10x1=10**

a.   A trapezoidal channel carries a discharge of 28.5 m3 /s, with a mean velocity of 1.5 m/s when lined with rubble masonry n = 0.017 one side is vertical and the other has a slope of 2H:IV. Determine the minimum slope and dimensions of the channel.

b.   Derive an equation for flow equation

$$\Delta x = \frac{\Delta E}{S_0 - S_f}$$

5.   Attempt any *one* part of the following: **10x1=10**

a.   A rectangular channel 5.5 m wide and 1.25m depth has a slope of 1 in 900 determine the discharge when Manning's n = 0.015 if it is desired to increase the discharge to a maximum. By changing the size of the channel but keeping the same quantity of lining determine the new dimensions and percentage increase in discharge

b.   Explain what you mean by the 'most economical' section of a channel. Develop the criterion for the most economical trapezoidal section of a channel if the side slopes arefixed.

6.   Attempt any *one* part of the following: **10x1=10**

a.   Water flows at the rate of 1.25 cumecs in a channel of rectangular section 1.5m wide. Calculate the critical depth, if a hydraulic jump occurs at a point where the upstream depth is 0.30m, what would be the rise of water level produced and the power lost in the jump?

b.   A rectangular channel is to carry a discharge of 25 cumecs at a slope of 0.006. Determine the width of the channel for the critical flow. Take n = 0.016

7.   Attempt any *one* part of the following: **10x1=10**

a.   In a rectangular channel, the discharge per unit width is 2.5 m3 /s/m, a hydraulic jump occurs and the loss of energy is 2.68 N.m/N. Determine the depths before and after the jump.

b.   What are Culverts? What they are used for and Differentiate between inlet controlled and outlet controlled culverts.
What do you mean by sudden transition and sudden contractions in an open channel explain with sketch.