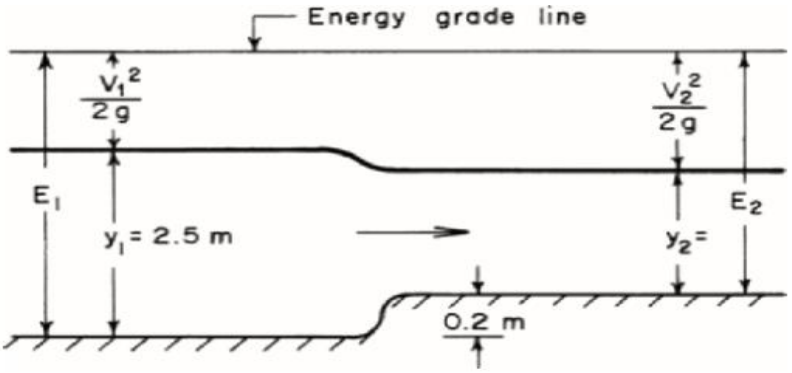
Assignments on energy -depth relationship and channel transition:

1. A 4-m wide rectangular channel is carrying 10 m3/s at a depth of 2.5 m. There is a step rise of 0.2 m in the channel bottom. Assuming there are no losses at the transition, determine the flow depth downstream of the bottom step. Does the water surface rise or fall at the step? (y2 = 2.29 m)



2. A bridge is planned on a 50-m wide rectangular channel carrying a flow of 200 m3/s at a flow depth of 4.0 m. For reducing the length of the bridge, what is the minimum channel width such that the upstream water level is not influenced for this discharge? (Ans: 14.4m)
3. Determine the discharge and upstream depth for flow over a broad crested weir of height 1.0 m in 10 m wide channel if the depth over the weir is 0.5 m. Weir is free flowing weir.
4. A rectangular channel is 3.0 m wide and carries a discharge of 3.30 m3/s at a depth of 0.9 m. A smooth contraction of the channel width is proposed at a section. Find the smallest contracted width that will not affect the upstream flow condition. Neglect energy losses in the transition. (Ans Bm=2.00 m)
5. A rectangular channel is 3.5 m wide and conveys a discharge of 15.0 m3/s at a depth of 2.0 m. It is proposed to reduce the width of the channels at a hydraulic structure. Assuming the transition to be horizontal and the flow to be frictionless determine the water surface elevation upstream and downstream of the constriction when the constricted width is (a) 2.50 m and (b) 2.75 m.

6. Define steady non-uniform, uniform, unsteady, gradually varied, rapidly varied and spatially varied flow with examples. Give at least 3 examples of each.
7. Define mild, critical, steep slope, bed slope, hydraulic slope, energy slope, normal and critical depth.
8. Define hydraulic exponent of channel. Obtain the hydraulic exponent value N for rectangular and triangular channel.
9. Define specific energy and show that a channel can pass same discharge at two different alternate depths of flow and also show that specific energy is minimum at critical flow condition. Include diagram also
10. Prove that at critical flow condition a channel can pass maximum discharge for fixed specific energy. Include diagram also.
11. A discharge of 16 m3/s flows with a depth of 2.0 m in a 4.0 m wide rectangular channel. At a downstream section the width is reduced to 3.5 m and the channel bed is raised by ΔZ. Analyse the water surface elevation in the transition when (a) $\Delta Z = 0.2\,m$ (b) $\Delta Z = 0.35\,m$
12. Consider a 5.0 m wide rectangular channel carrying 20 m3/s discharge at a depth of 2.0 m. (i) Determine the width to which the channel should be contracted so that the depth in the contracted section is critical .(II) what will be the depth at the contracted section if width is 4.0 m (iii) what will be the depth of flows in the upstream and in the contracted section if the width of the channel is reduced to 2.5 m. (3.587,1.82,2.694,1.869)
13. A 3.5 m wide rectangular channel carries a discharge of 10 m3/s at a depth of 1.75 m. If the width of the channel is reduced to 2.25 m and the bed level is lowered by 0.97 m , determine the difference in water level elevations between the upstream and contracted sections. Assume no energy loss.(y2 = 2.72 m)