Assignments on Rapidly varied flow

1. Water flows in a rectangular channel at a depth of 0.5m and a velocity of 12 m/s, find
(a) The alternate depth at this discharge,
(b) The conjugate depth at this discharge, and
(c) The head loss in the jump if the jump takes place at this section. (7.79 m, 3.59 m, 4.11 m)
2. A hydraulic jump occurs in a rectangular channel and the depths of flow before and after the jump are 0.5 m and 2.0 m respectively. Calculate the critical depth and power lost per unit width of the channel.(1.077 m,28.74 kw)
3. The depth of flow and mean velocity at the toe of a jump in a rectangular channel on a horizontal floor are 1.0 m and 15.0 m/s respectively. Plot the profile of the hydraulic jump.
4. Water issues from a sluice gate in a wide rectangular channel at the rate of 6 m^2/s. The depth of flow at the vena contracta is 0.5 m. the downstream channel has a slope of 1 in 900 and has a Manning's roughness coefficient of 0.015. Find the length of the concrete apron required. (282.27 m)
5. A hydraulic jump takes place in a horizontal rectangular channel with sequent depths of 0.25 m and 1.5 m at the beginning and end of the jump respectively. Estimate the (a) discharge per unit width of channel and (b) energy loss in the jump. (1.794 m3/s/m ,1.302 m)
6. In a hydraulic jump taking place in a horizontal apron an ogee-shaped weir, the discharge per unit width is 2.5 m3/s/m and the energy loss is 2.75 m. Estimate the depths at the toe and heel of the jump.
7. An overflow spillway is 40.0 m high. At the design energy head of 2.5 m over the spillway, find the sequent depths and energy loss in a hydraulic jump formed on a horizontal apron at the toe of the spillway. Neglect energy loss due to flow over the spillway face. (assume Cd=0.378)
8. Draw a hydraulic jump profile and indicate conjugate depths and energy loss using the specific energy and specific force diagram. Hence derive momentum equation for the hydraulic jump in rectangular channel.