FLOOD CONTROL

Problem 1: Flood routing calculations will be done for a dam that is full of water at the beginning of the flood. Water surfaces areas of the dam are $2x10^6$ m^2 and $3x10^6$ m^2 for the beginning and at end of the flood, respectively. Inflow rates are 520 m^3/s and 680 m^3/s for each time. The width of the spillway is 60 m and the spillway coefficient is 2.2. Determine the rise of the water level after 2 hours (Take time intervals as 2 hours).

Problem 2: River training is going to be planned for Q= 274 m^3/s flow rate of the river. Water depths are given in the following Figure 1. The bottom slope is 0.0008, Manning roughness coefficient for the main channel and flood plains are 1/40 and 1/25, respectively. Determine the width of the flood plains.

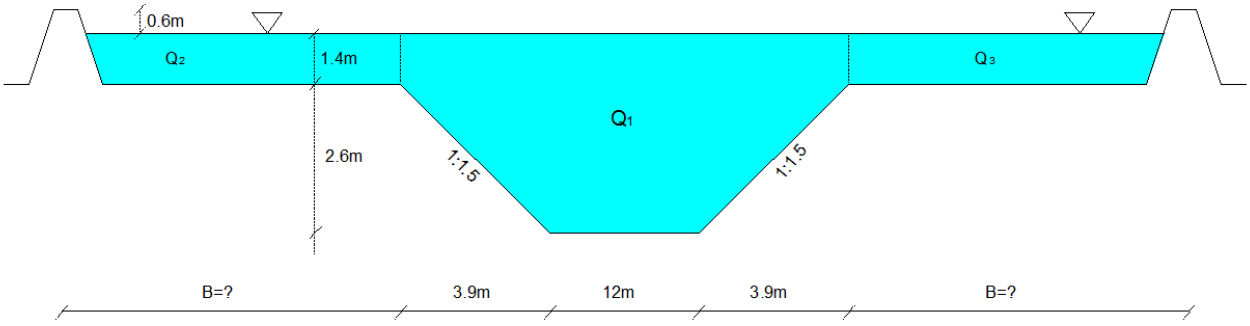
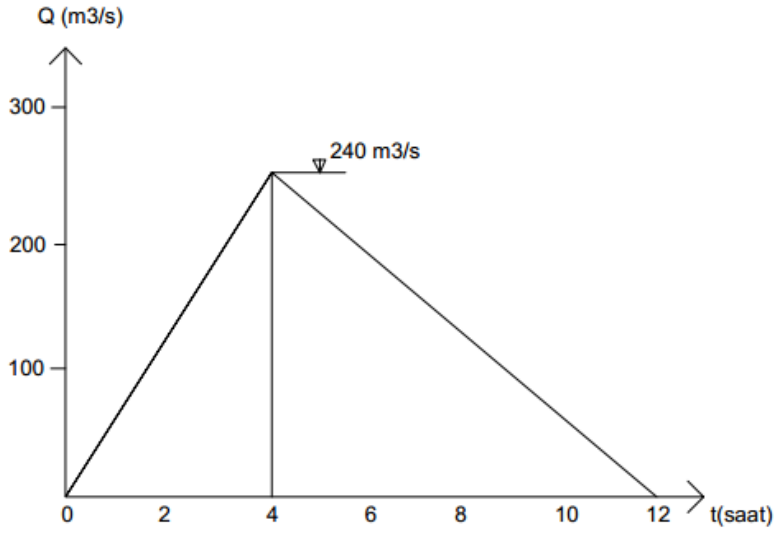


Figure 1.

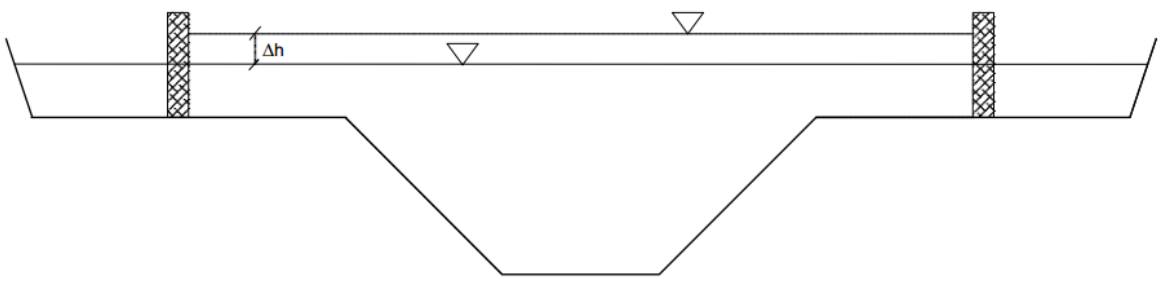
Problem 3: Constant incoming flowrate to a flood detention dam is 8 m^3/s. The diameter and length of the sluiceway (bottom outlet) are 1.0 m and 60 m, respectively. The friction coefficient of Darcy-Weisbach is 0.015. Determine the time which is needed to raise the water level from 5 m to 7 m.

Problem 4: A triangular shape of a flood hydrograph is given in the following figure. The net width of the spillway and spillway coefficient are 32 m and 2.2**,** respectively. The rating curve equation is given as a function of the spillway head (***V=3x10^{6}xH$^{0.5}$***). Consider the reservoir is full at the beginning of the flood. Find the maximum spillway head, spillway discharge, and amount of water retained at the reservoir.

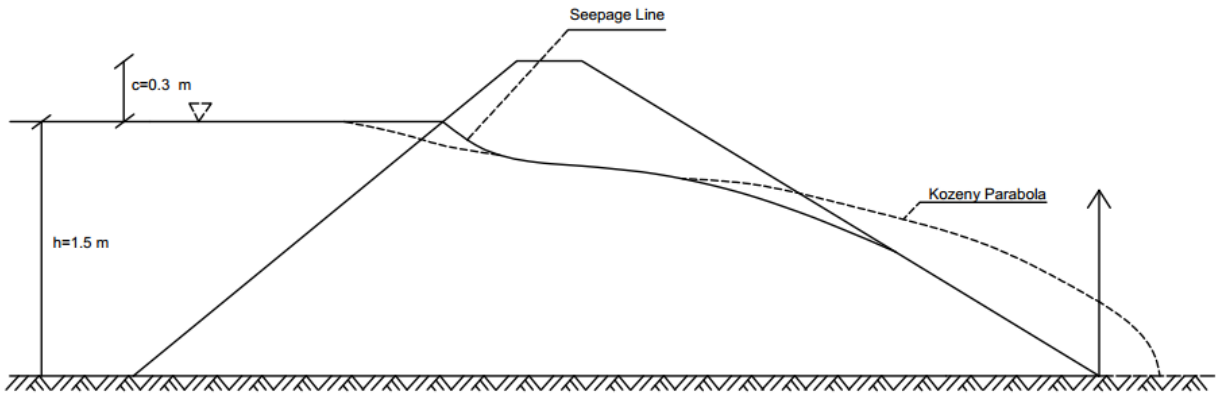


Problem 5: River training with embankments (or levees) for flood control is planned. During the flood, the width and water level of the channel increase 120 m and 1.4 m, respectively. The slope of the water surface before and after the training is 0.004 m/m. The manning roughness coefficients for main channel $n_{\text{main channrel}}$= 0.025**,** for flood plain, $n_{\text{flood plain}}$= 0.04.

a) Determine the increase of the water depth if the total width of the channel decreases to **60** m with embankments.
b) Find the required width of the channel if the maximum water depth increment (Δh) is only **0.1** m after the construction of embankments.



Problem 6: Determine the amount of the seepage (m^3/day) and seepahe line (phreatic line) for 2.4 km length of an embankment. The top width of the embankment is 2.0 m, outer and inner slopes of the embankment are 1:3 and 1:2, respectively. Freeboard is 0.3 m, the height of the embankment is 1.8 m and the permeability coefficient (k) is $2x10^{-6}$ m/s.



Problem 7: River training using floodwalls is planned for a trapezoidal channel that carries 280 m^3/s discharge. The bottom width of the channel is 12 m and the side slope is 1:2. The channel bed slope is 0.002. Freeboard is 0.5 m, Manning roughness coefficient before training and after training are 0.035 and 0.030, respectively. Determine the width of the floodwalls if water depth over the main channel is 3.5 m