
A trapezoidal channel having a bottom slope of 0.001 is carrying a flow of $30 \text{ m}^3/\text{s}$. The bottom width is 10.0 m and the side slopes are 2H to 1V. At the downstream end, a control structure raises the water depth to 5.0 m.

Determine the water-surface levels at 1, 2, and 4 km upstream of control structure using Standard Step Method in Excel Software. The Manning n for the flow surfaces is 0.013, $\alpha = 1.0$, and the elevation of the channel bottom at the downstream end is 0.0.