

**Q1**

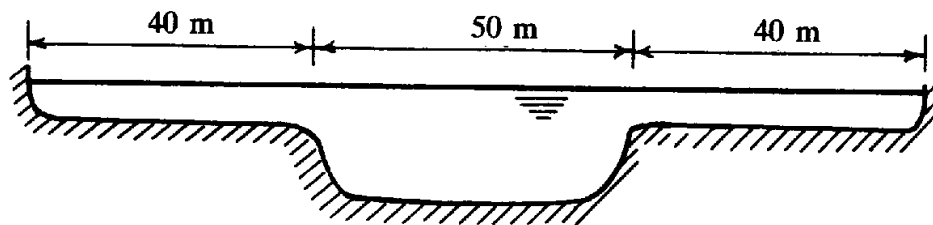
A concrete-lined trapezoidal channel has a bed width of 3.5 m, side slopes at  $45^\circ$  to the horizontal, a bed slope 1 in 1000 and Manning roughness coefficient of 0.015. Calculate the depth of uniform flow when the discharge is  $20 \text{ m}^3/\text{s}$ .

**Q2**

A trapezoidal channel with side slopes 1 : 1 and bed slope 1 : 1000 has a 3 m wide bed composed of sand ( $n = 0.02$ ) and sides of concrete ( $n = 0.014$ ). Estimate the discharge when the depth of flow is 2.0 m.

**Q3**

The figure shows the cross-section of a river channel passing through a flood plain. The main channel has a bank full area of  $300 \text{ m}^2$ , a top width of 50 m, a wetted perimeter of 65 m and a Manning roughness coefficient of 0.025. The flood plains have a Manning roughness of 0.035 and the gradient of the main channel and plain is 0.00125. Determine the depth of flow over the flood plain at a flood discharge of  $2470 \text{ m}^3/\text{s}$ .



**Q4**

8. A trapezoidal channel with a bed slope of 0.005, bed width 3 m and side slopes 1 : 1.5 (vertical : horizontal) has a gravel bed ( $n = 0.025$ ) and concrete sides ( $n = 0.013$ ). Calculate the uniform flow discharge when the depth of flow is 1.5 m using (a) the Einstein, (b) the Pavlovskij, and (c) the Lotter methods.