

3.5 Manning's Equation

$$Q = \frac{A}{n} R^{2/3} S^{1/2} \quad \text{for open channel}$$

Q = discharge

A = cross-sectional area

R = hydraulic radius

$= A / P$, P = wetted perimeter

n = Manning's roughness coefficient

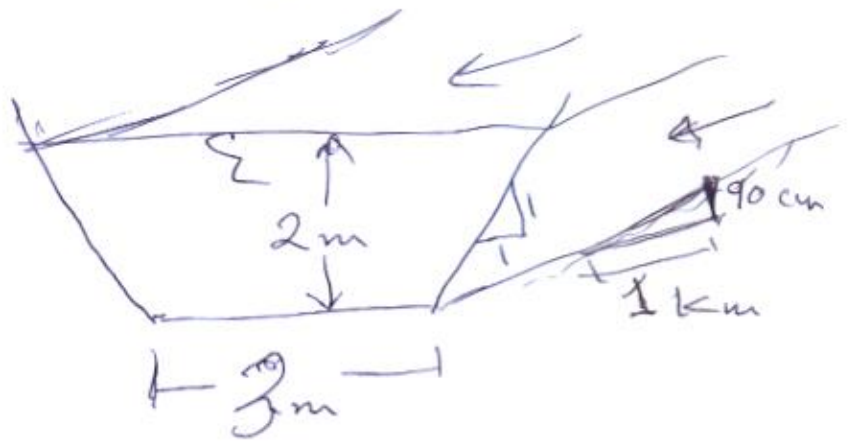
$\approx 0.01 - 0.04$

depends on bed material

S = bed slope for channel



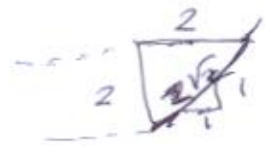
EX: For the shown channel,
find the discharge



- Concrete,
($n = 0.012$)

$$S = \frac{90}{100,000} = 0.0009$$

$$P = 3 + 2 \times 2\sqrt{2} = 8.66 \text{ m}$$



$$A = \left[\frac{3 + (3 + 2 + 2)}{2} \right] \times 2 = 10 \text{ m}^2$$

$$\begin{aligned} Q &= \frac{10}{0.012} \times \left(\frac{10}{8.66} \right)^{2/3} (0.0009)^{1/2} \\ &= 27.52 \text{ m}^3/\text{s} \end{aligned}$$