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3.26. From the given data: $Q = 50$ m^3/s, $b = 4$ m, and $m = 1.5$. Under critical flow conditions

$$\frac{Q^2}{g} = \frac{A^3}{T}$$

which gives

$$\frac{50^2}{9.81} = \frac{(4y_c + 1.5y_c^2)^3}{4 + 2(1.5)y_c}$$

Solving by trial and error yields

$$\boxed{y_c = 1.96 \text{ m}}$$

When $y = 3$ m, the Froude number, Fr, is given by the relation

$$\begin{aligned} \text{Fr}^2 &= \frac{Q^2T}{gA^3} \\ &= \frac{(50)^2(4 + 2 \times 1.5 \times 3)}{(9.81)(4 \times 3 + 1.5 \times 3^2)^3} = 0.19 \end{aligned}$$

hence

$$\boxed{\text{Fr} = 0.45}$$

and the flow is $\boxed{\text{subcritical}}$.

3.27. From the given data: $w_1 = 2$ m, $Q = 3$ m^3/s, $y_1 = 1.2$ m, and $w_2 = w_1 - 0.4$ m $= 1.6$ m. Conservation of energy requires that

$$y_1 + \frac{V_1^2}{2g} = y_2 + \frac{V_2^2}{2g}$$

where

$$\begin{aligned} V_1 &= \frac{Q}{A_1} = \frac{Q}{w_1y_1} = \frac{3}{(2)(1.2)} = 1.25 \text{ m/s} \\ V_2 &= \frac{Q}{A_2} = \frac{Q}{w_2y_2} = \frac{3}{1.6y_2} = \frac{1.875}{y_2} \text{ m/s} \end{aligned}$$

Substituting into the energy equation gives

$$\begin{aligned} 1.2 + \frac{1.25^2}{2(9.81)} &= y_2 + \frac{(1.875/y_2)^2}{2(9.81)} \\ 1.28 &= y_2 + \frac{0.179}{y_2^2} \end{aligned}$$

Solving for y_2 gives

$$y_2 = 0.47 \text{ m}, 1.14 \text{ m}$$

These depths correspond to supercritical and subcritical flow conditions respectively. Since the upstream flow is subcritical, the flow in the constriction must also be subcritical, hence

$$\boxed{y_2 = 1.14 \text{ m}}$$