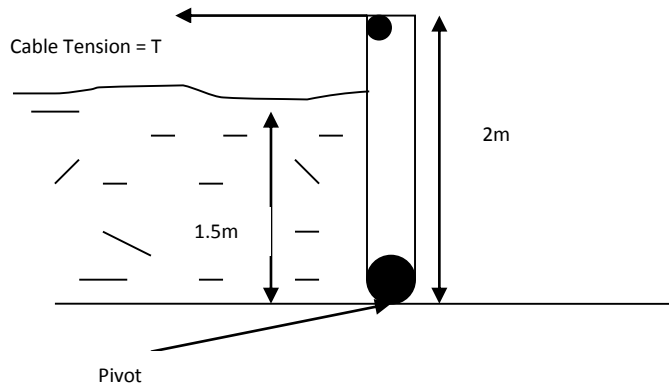


Answer on Question #58947-Physics-Mechanics-Relativity

Water is retained in a 1 m wide rectangular section channel by a sluice gate that can pivot about its base, as shown above. Determine the tension in the horizontal retaining cable attached to the top of the gate which is 2 m high when the depth of water in the channel is 1.5 m. The density of water is 1000 kg m^{-3} .

Solution



First find pressure at bottom of gate:

$$P = 10 \frac{\text{m}}{\text{s}^2} \left(\frac{1000 \text{ kg}}{\text{m}^3} \right) \cdot 1.5 \text{ m} = 15000 \text{ Pa}$$

Area of gate covered with water

$$A = 1 \text{ m} \cdot 1.5 \text{ m} = 1.5 \text{ m}^2$$

Force on gate

$$F = (15000 \text{ Pa}) 1.5 \text{ m}^2 = 22.5 \text{ kN}$$

Force acts on pressure prism at $\frac{2}{3}$ water depth = 1m or 0.5m from bottom.

Take sum of moments about pivot = 0.

$$(22.5 \text{ kN}) \cdot 0.5 \text{ m} - T \cdot 2 \text{ m} = 0$$

$$T = \frac{22.5 \text{ kN}}{4} = 5625 \text{ N}.$$