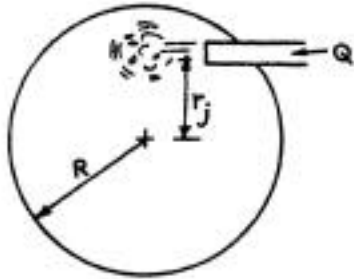
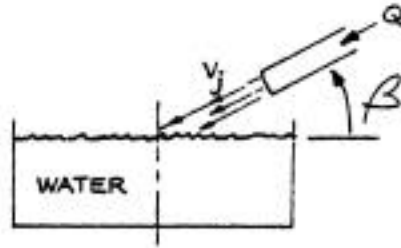


Problem 5.29

Startup of circulatory flow in tank



TOP VIEW



FRONT VIEW

At $t = 0$, a circular tank with radius R contains water at rest with depth h . Between $0 < t < \tau$, a water hose is sprayed onto the surface of the water in the tank at a volume flow rate Q and an exit velocity V_j . The jet impacts tangentially on the water at a radius r_j , with an angle β relative to the horizontal.

After the time τ the hose is turned off. Eventually, because of friction *within* the water, all (or at least most) of the water in the tank will end up rotating like a solid body.

Derive an expression for the *final* angular rate of rotation Ω of the water, assuming the effect of shear forces between the water and the walls of the tank during the startup of the rotary flow is negligible.

HINT

HINT 2

HINT 3

ANSWER