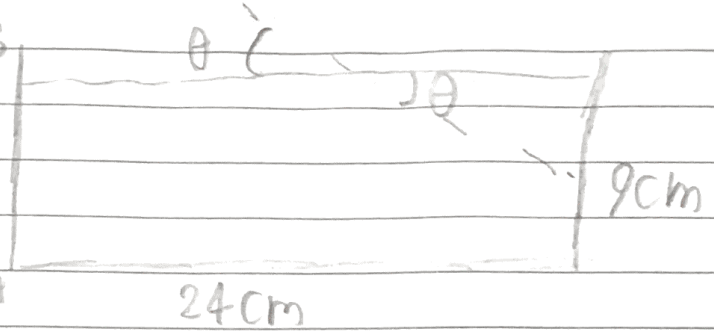
1) $\tan\theta = \frac{a_x}{g}$

$\theta = \tan^{-1}\frac{6}{9.81} = 31.45^\circ$

$\because \Delta z = 12$

$\tan\theta \simeq 7.34\,cm$



depth $= 9 + 7.34 \simeq 16.3\,cm$

a) ∴ water depth AB is 16.3 cm

$F_{AB} = P_{CG} A_{AB} = (9790)\left(\frac{0.163}{2}\right)(0.163)(0.12) \simeq 15.7\,N$

b) ∴ Water Pressure Force on Panel AB is 15.7 N

2) $h = \frac{w^2 R^2}{2g}$

$w = \sqrt{\frac{2gh}{R^2}}$

$= \sqrt{\frac{2(32.2)(8/12)}{(7/12)^2}}$

$= 11.2\ rad/s \times \frac{60}{2\pi}$

$= 107\ r/min$

∴ The appropriate rotation rate is 107 r/min

3) $z_B = h_0 + \frac{\omega^2 R_B^2}{2g}$

$z_A = h_0 + \frac{\omega^2 R_A^2}{2g}$

$z_A - z_B = \frac{\omega^2}{2g}(R_A^2 - R_B^2)$

$\omega = \sqrt{\frac{(z_A - z_B)(2g)}{[R_A^2 - R_B^2]}}$

$= \sqrt{\frac{(0.22 - 0.12)(2 \times 9.81)}{(0.12^2 - 0.05^2)}}$

$= 12.84 \text{ rad/s} \times \frac{60}{2\pi}$

$= 122.616 \text{ r/min}$

∴ The uniform rotation rate about axis C is 122.616 r/min

4) $Q = \int v_h \, dA$

$= \int_0^h U_0 \left(\frac{2y}{h} - \frac{y^2}{h^2}\right) b \, dy$

$= -U_0 b \int_0^h \frac{y^2}{h^2} - \frac{2y}{h} \, dy$

$\left[\frac{y^3}{3h^2} - \frac{y^2}{h}\right]_0^h$

$= \frac{h}{3} - h = -\frac{2h}{3}$

a) ∴ The volume rate of flow is $\frac{2}{3} U_0 bh$

$Q = \frac{2}{3} U_0 bh$

$U_0 = \frac{3Q}{2bh}$

$Q = 4.73 \frac{L}{\cancel{min}} \times \frac{10^6 mm^3}{L} \times \frac{\cancel{min}}{60 s}$

$= 78833.3 \ mm^3/s$

$U_0 = \frac{3(78833.3)}{2(1)(12.7)}$

$= 9311.02 \ mm/s$

b) ∴ The surface velocity U_0 is 9311.02 mm/s