CT – 1

Q.1. Power law model

when $\left|\frac{du}{dy}\right| = 10\,s^{-1}$, $\tau = 10[10]^{0.2} = 15.85\ N/m^2$

when $\left|\frac{du}{dy}\right| = 50\,s^{-1}$, $\tau = 10[50]^{0.2} = 21.87\ N/m^2$

Bingham Plastic model

$\tau = \tau_0 + \mu\left|\frac{du}{dy}\right|$

when $\frac{du}{dy} = 10\,s^{-1}$ $\quad \tau_0 + \mu[10] = 15.85$

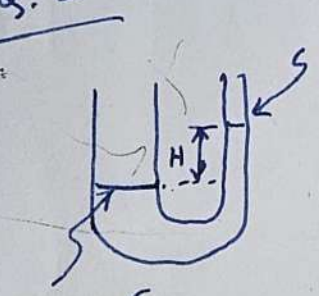
when $\frac{du}{dy} = 50\,s^{-1}$ $\quad \tau_0 + \mu[50] = 21.87$

} Two equations, two unknowns

$\tau_0 = 14.35\ N/m^2$

$\mu = 0.150\ N.s/m^2$

Q.2



$$\left(P_{atm} - \frac{2\sigma}{r_{1.5}}\right) - \left(P_{atm} - \frac{2\sigma}{r_1}\right) = H\,(\rho_{H_2O} - \rho_{air})\,g$$

$$H = \frac{2\sigma\left[\frac{1}{r_1} - \frac{1}{r_{1.5}}\right]}{(\rho_{H_2O} - \rho_{air})\,g}$$

Here,

$\sigma = 0.0736\ N\,m^{-1}$

$r_1 = 10^{-3}\ m/2$

$r_{1.5} = 1.5 \times 10^{-3}\ m/2$

$\rho_{H_2O} = 1000\ kg\,m^{-3}$

$\rho_{air} =$ Neglected.