Since the body is in equilibrium

$B_1 + B_2 = W$

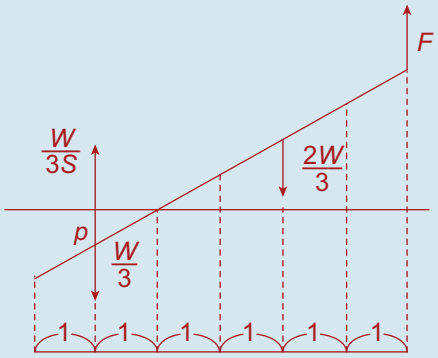
$\Rightarrow 1{,}000v_1g + 13{,}600v_2g = 7{,}800(v_1 + v_2)g$

$\Rightarrow 5{,}800v_2 = 6{,}800v_1$

$\Rightarrow \frac{v_1}{v_2} = \frac{58}{68} = \frac{29}{34}$

Exercise 9E

Q. 1. (i)



① $F + \frac{W}{3s} = W$

② Taking moments about p:

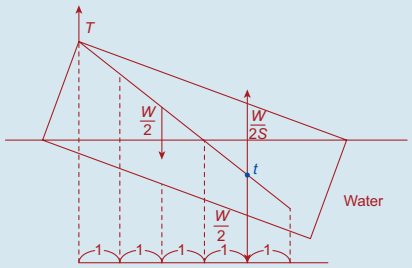
$\frac{2W}{3}(3) = F(5) \Rightarrow F = \frac{2}{5}W$

(ii) ① $\Rightarrow \frac{2}{5}W + \frac{W}{3S} = W$

$\Rightarrow \frac{W}{3S} = \frac{3}{5}W$

$\Rightarrow S = \frac{5}{9}$

Q. 2. (i)



(ii) ① $T + \frac{W}{2S} = W$

② (Taking moments about t)

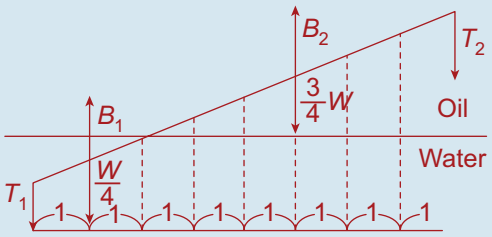
$\frac{W}{2}(2) = T(4) \Rightarrow T = \frac{1}{4}W \left(\therefore B = \frac{3}{4}W\right)$

(iii) ① $\Rightarrow \frac{1}{4}W + \frac{W}{2S} = W$

$\Rightarrow \frac{W}{2S} = \frac{3}{4}W$

$\Rightarrow S = \frac{2}{3}$

Q. 3.



$B_W = \frac{W}{S} \Rightarrow B_1 = \frac{\frac{W}{4}}{\frac{3}{4}} = \frac{W}{3}$

$B_L = S_L B_W = S_L\left(\frac{W}{S}\right) \Rightarrow B_2 = (0.9)\left(\frac{\frac{3}{4}W}{\frac{3}{4}}\right) = \frac{9W}{10}$

① $\frac{W}{3} + \frac{9W}{10} = T_1 + \frac{W}{4} + \frac{3}{4}W + T_2$

$\Rightarrow T_1 + T_2 = \frac{7W}{30}$

② (Taking moments about the lower end)

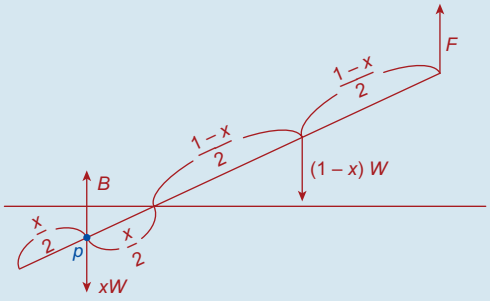
$\frac{W}{3}(1) + \frac{9W}{10}(5) = \frac{W}{4}(1) + \frac{3}{4}W(5) + T_2(8)$

$\Rightarrow T_2 = \frac{5W}{48}$

$\Rightarrow T_1 = \frac{7W}{30} - \frac{5W}{48}$

$= \frac{31W}{240}$

Q. 4.



Let W = the weight of the rod.

Let x = the length of the submerged part.

$B_W = \frac{W}{S} \Rightarrow B = \frac{xW}{0.36} = \frac{25xW}{9}$

① $\frac{25xW}{9} + F = W$

② (Taking moments about p).

$(1 - x)W\left(\frac{x}{2} + \frac{1 - x}{2}\right) = F\left(\frac{x}{2} + 1 - x\right)$

$\Rightarrow (1 - x)W\left(\frac{1}{2}\right) = F\left(1 - \frac{x}{2}\right)$

$\Rightarrow F = \frac{(1 - x)W}{2 - x}$