Putting this result into equation ① gives:

$$\frac{25xW}{9} + \frac{(1-x)W}{(2-x)} = W$$

... Multiply by $\frac{9(2-x)}{W}$

$$\Rightarrow 25x(2-x) + 9(1-x) = 9(2-x)$$

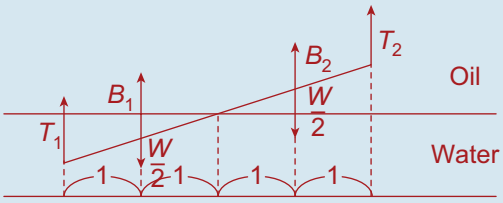
$$\Rightarrow 25x^2 - 50x + 9 = 0$$

$$\Rightarrow (5x-1)(5x-9) = 0$$

$\Rightarrow x = \frac{1}{5}$ m ($x = \frac{9}{5}$ m is too long)

Answer: 20 cm is submerged.

Q. 5.



$$B_W = \frac{W}{S} \Rightarrow B_1 = \frac{\frac{1}{2}W}{6} = \frac{W}{12}$$

$$B_L = S_L B_W = S_L\left(\frac{V}{S}\right) = 0.8\left(\frac{\frac{1}{2}W}{6}\right) = \frac{W}{15}$$

$$T_1 + \frac{W}{12} + \frac{W}{15} + T_2 = W$$

$$\Rightarrow T_1 + T_2 = \frac{51}{60}W$$

(Taking moments about the lower end).

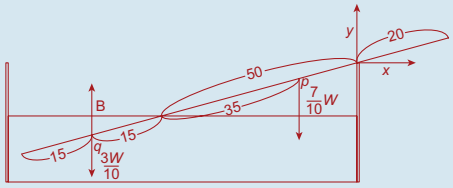
$$① + \frac{W}{15}(3) + T_2(4) = \frac{W}{2}(1) + \frac{W}{2}(3)$$

$$\Rightarrow T_2 = \frac{103}{240}W$$

$$\Rightarrow T_1 = \frac{51}{60}W - \frac{103}{240}W$$

$$= \frac{101}{240}W$$

Q. 6. (i)



Let x and y be the horizontal and vertical components of the reaction at p, $x = 0$ since no other forces act along the vertical. Therefore, the reaction at p is vertical. We shall henceforth call it R.

(ii) $B_W = \frac{W}{S}$

$$\Rightarrow B = \frac{\frac{3}{10}W}{S} = \frac{3W}{10s}$$

$$① \quad \frac{3W}{10S} + R = W$$

② (Taking moments about q)

$$\frac{7}{10}W(50) = R(65)$$

$$\Rightarrow R = \frac{7}{13}W$$

Putting this into equation ① gives:

$$\frac{3W}{10S} + \frac{7}{13}W = W$$

$$\Rightarrow \frac{3W}{10S} = \frac{6W}{13}$$

$$\Rightarrow S = \frac{39}{60}$$

$$= \frac{13}{20}$$