Adding equations **1** and **2** gives

$18.5g = 49a$

$\Rightarrow a = \dfrac{18.5g}{49}$

$= 3.7 \text{ m/s}^2$

(ii) Acceleration of $B = 2a$

$= 2(3.7)$

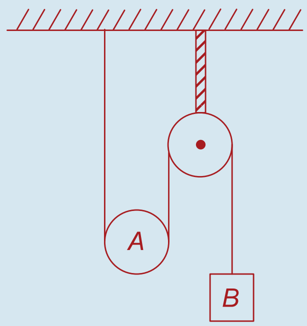
$= 7.4 \text{ m/s}^2$

(iii) $T - 4g = 4a$

$\Rightarrow T = 4(3.7) + 4g$

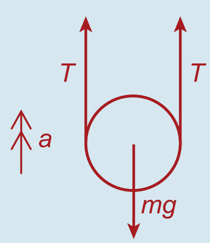
$\Rightarrow T = 54$ N

Q. 5.



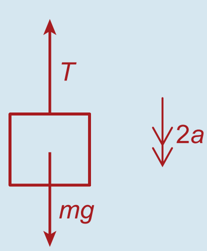
If A moves up 1 metre, B will move down 2 metres, since there will be 2 metres more string available. Hence, if A moves up x metres while B moves down y metres, it follows that $y = 2x$. Hence, the velocity and acceleration of B will be twice those of A. Therefore, if the acceleration of A is a, then the acceleration of B will be $2a$.

(i) **Pulley A:**



$2T - mg = ma$ **Equation 1**

Particle B:



$mg - 2T = m(2a)$

$\Rightarrow 2mg - 2T = 4ma$ **Equation 2**

Adding equations **1** and **2** gives

$mg = 5ma$

$\Rightarrow a = \frac{1}{5}g$

(ii) $2T - mg = ma$

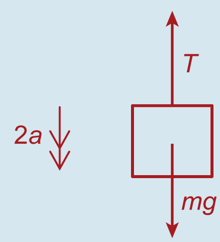
$\Rightarrow 2T - mg = m\left(\frac{g}{5}\right)$

$\Rightarrow 10T - 5mg = mg$

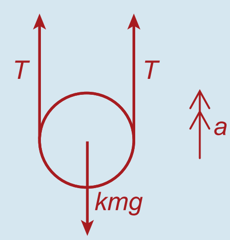
$\Rightarrow 10T = 6mg$

$\Rightarrow T = \frac{3}{5}mg$

Q. 6. (i) **Particle E:**



Pulley C:



(ii) $mg - T = m(2a)$

$\Rightarrow 2mg - 2T = 4ma$ **Equation 1**

$2T - kmg = kma$ **Equation 2**

Adding equations **1** and **2** gives

$2mg - kmg = 4ma + kma$

$\Rightarrow 2g - kg = 4a + ka$

$\Rightarrow (2 - k)g = a(4 + k)$

$\Rightarrow a = \dfrac{(2 - k)g}{4 + k}$

(iii) Let $k = 0.5$

$\Rightarrow a = \dfrac{1.5g}{4.5} = \dfrac{g}{3}$

$\Rightarrow T = mg - 2ma$ from **Equation 1**

$\Rightarrow T = mg - 2m\left(\frac{g}{3}\right)$

$\Rightarrow T = mg - \frac{2}{3}mg = \frac{1}{3}mg$