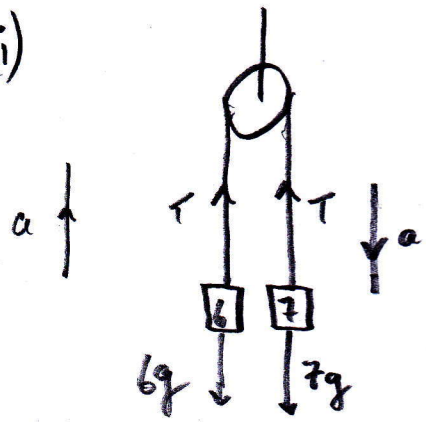
2013 Q4.

(a)(i)




$F = ma$

$7g - T = 7a$ ①

$T - 6g = 6a$ ②

$\Rightarrow \quad g = 13a$

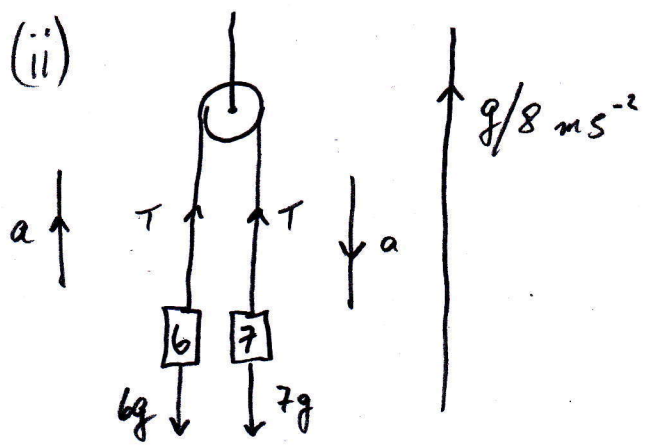
$\Rightarrow \quad a = \frac{g}{13}$

$7g - T = 7a$ ①

$\Rightarrow 7g - T = 7\left(\frac{g}{13}\right) \Rightarrow T = 7g - \frac{7g}{13}$

$\Rightarrow T = 63.32\ N$

(ii)




$7g - T = 7a$ ①

$\Rightarrow 7g - T = 7\left(a - \frac{g}{8}\right)$

and $T - 6g = 6\left(a + \frac{g}{8}\right)$ ②

$g = 7a - \frac{7g}{8} + 6a + \frac{6g}{8}$

$\Rightarrow g = 13a - \frac{g}{8}$

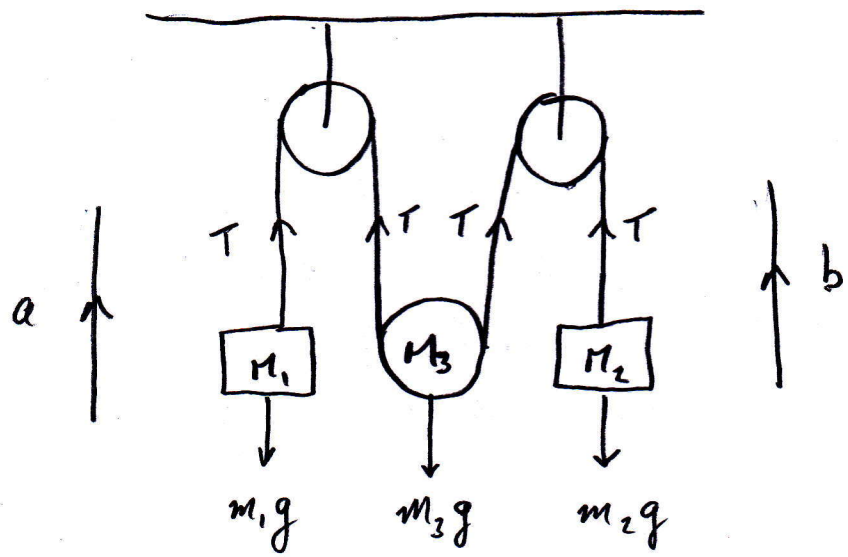
$\Rightarrow g + \frac{g}{8} = 13a$

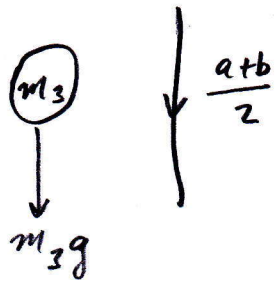
$\Rightarrow \frac{9g}{8} = 13a \Rightarrow a = \frac{9}{104}g$

$T - 6g = 6\left(\frac{9}{104}g + \frac{g}{8}\right)$ ② $\Rightarrow T = 71.24\ N$

$\Rightarrow T =$

(b)




$F = ma$

$$T - m_1 g = m_1 a \quad ①$$

$$T - m_2 g = m_2 b \quad ②$$

$$m_3 g - 2T = m_3 \left( \frac{a+b}{2} \right) \quad ③$$

① $T - m_1 g = m_1 a \Rightarrow a = \frac{T}{m_1} - g$

② $T - m_2 g = m_2 b \Rightarrow b = \frac{T}{m_2} - g$

③ $m_3 g - 2T = \frac{m_3}{2} \left( \frac{T}{m_1} - g + \frac{T}{m_2} - g \right)$

$\Rightarrow 2m_3 g - 4T = \frac{m_3 T}{m_1} - m_3 g + \frac{m_3 T}{m_2} - m_3 g$

$\Rightarrow 2m_1 m_2 m_3 g - 4 m_1 m_2 T = m_2 m_3 T - m_1 m_2 m_3 g + m_1 m_3 T - m_1 m_2 m_3 g$

$\Rightarrow 4 m_1 m_2 m_3 g = T (4 m_1 m_2 + m_2 m_3 + m_1 m_3)$ etc.