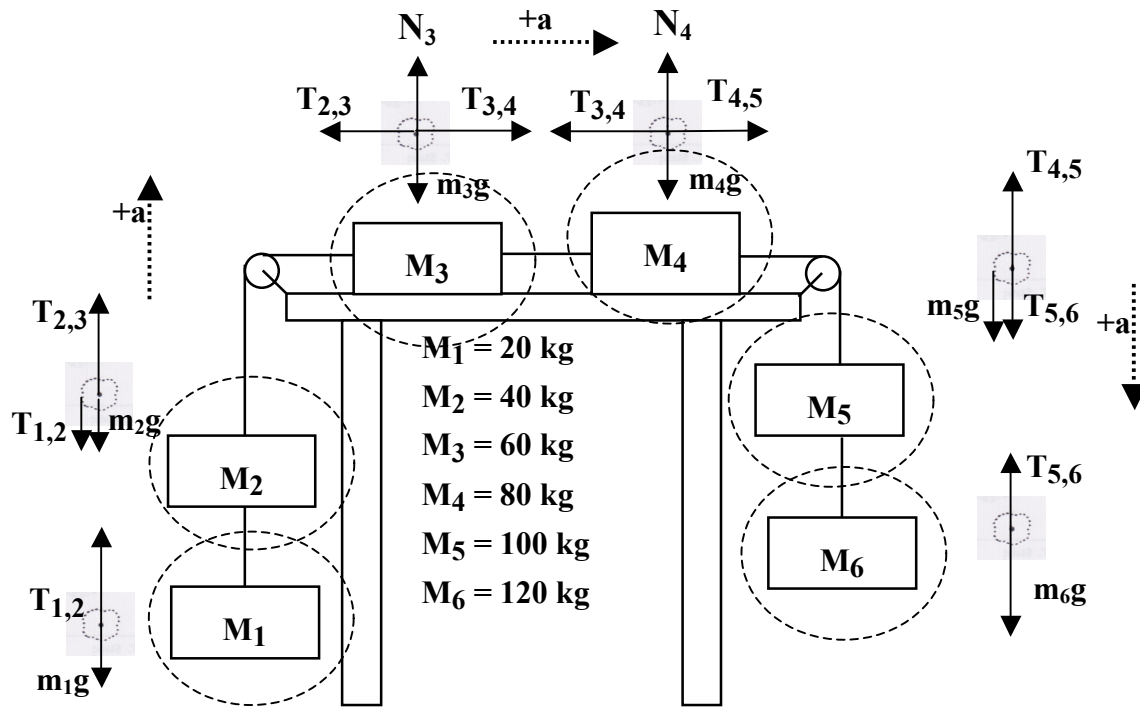


Single Body Analysis #7

$N = F_{\text{surface,box} \perp} = \text{Normal Force}$, $T = F_{\text{rope,box}}$, $F_{\text{earth, box}} = mg$)



$$T_{1,2} - m_1g = m_1a$$

$$T_{2,3} - T_{1,2} - m_2g = m_2a$$

$$T_{3,4} - T_{2,3} = m_3a$$

$$T_{4,5} - T_{3,4} = m_4a$$

$$T_{5,6} + m_5g - T_{4,5} = m_5a$$

$$m_6g - T_{5,6} = m_6a$$

$$m_6 g + m_5 g - m_2 g - m_1 g = m_1 a + m_2 a + m_3 a + m_4 a + m_5 a + m_6 a$$

$$m_6 g + m_5 g - m_2 g - m_1 g = (m_1 + m_2 + m_3 + m_4 + m_5 + m_6) a$$

$$a = \frac{m_6 g + m_5 g - m_2 g - m_1 g}{(m_1 + m_2 + m_3 + m_4 + m_5 + m_6)}$$

$$a = \frac{(120\text{kg})(10 \text{ m/s}^2) + (100\text{kg})(10 \text{ m/s}^2) - (40\text{kg})(10 \text{ m/s}^2) - (20\text{kg})(10 \text{ m/s}^2)}{(20\text{kg}) + (40\text{kg}) + (60\text{kg}) + (80\text{kg}) + (100\text{kg}) + (120\text{kg})}$$

$$a = 3.81 \text{ m/s}^2$$

$$T_{1,2} - m_1 g = m_1 a$$

$$T_{1,2} = m_1 a + m_1 g$$

$$T_{1,2} = (20\text{kg})(3.81 \text{ m/s}^2) + (20\text{kg})(10 \text{ m/s}^2)$$

$$T_{1,2} = 276 \text{ N}$$

$$T_{2,3} - T_{1,2} - m_2 g = m_2 a$$

$$T_{2,3} = m_2 a + T_{1,2} + m_2 g$$

$$T_{2,3} = (40\text{kg})(3.81 \text{ m/s}^2) + (276 \text{ N}) + (40\text{kg})(10 \text{ m/s}^2)$$

$$T_{2,3} = 828 \text{ N}$$

$$T_{3,4} - T_{2,3} = m_3 a$$

$$T_{3,4} = m_3 a + T_{2,3}$$

$$T_{3,4} = (60\text{kg})(3.81 \text{ m/s}^2) + (828 \text{ N})$$

$$T_{3,4} = 1057 \text{ N}$$

$$T_{4,5} - T_{3,4} = m_4 a$$

$$T_{4,5} = m_4 a + T_{3,4}$$

$$T_{4,5} = (80\text{kg})(3.81 \text{ m/s}^2) + (1057 \text{ N})$$

$$T_{4,5} = 1362 \text{ N}$$

$$T_{5,6} + m_5 g - T_{4,5} = m_5 a$$

$$T_{5,6} - T_{4,5} = m_5 a - m_5 g$$

$$T_{5,6} = m_5 a - m_5 g + T_{4,5}$$

$$T_{5,6} = (100\text{kg})(3.81 \text{ m/s}^2) - (100\text{kg})(10 \text{ m/s}^2) + (1362 \text{ N})$$

$$T_{5,6} = 743 \text{ N}$$

$$m_6 g - T_{5,6} = m_6 a$$

$$-T_{5,6} = m_6 a - m_6 g$$

$$T_{5,6} = -(m_6 a - m_6 g)$$

$$T_{5,6} = 120 \text{ kg} * 10 \text{ m/s}^2 - 120 \text{ kg} * 3.81 \text{ m/s}^2$$

$$T_{5,6} = 743 \text{ N}$$