76. We choose positive coordinate directions (different choices for each item) so that each is accelerating positively, which will allow us to set $a_1 = a_2 = R\alpha$ (for simplicity, we denote this as a). Thus, we choose upward positive for m_1, downward positive for m_2 and (somewhat unconventionally) clockwise for positive sense of disk rotation. Applying Newton's second law to m_1, m_2 and (in the form of Eq. 11-37) to M, respectively, we arrive at the following three equations.

$$\begin{aligned} T_1 - m_1 g &= m_1 a_1 \\ m_2 g - T_2 &= m_2 a_2 \\ T_2 R - T_1 R &= I\alpha \end{aligned}$$

(a) The rotational inertia of the disk is $I = \frac{1}{2}MR^2$ (Table 11-2(c)), so we divide the third equation (above) by R, add them all, and use the earlier equality among accelerations – to obtain:

$$m_2 g - m_1 g = \left(m_1 + m_2 + \frac{1}{2}M\right) a$$

which yields $a = \frac{4}{25}\,g = 1.6\ \mathrm{m/s^2}$.

(b) Plugging back in to the first equation, we find $T_1 = \frac{29}{24} m_1 g = 4.6$ N (where it is important in this step to have the mass in SI units: $m_1 = 0.40$ kg).

(c) Similarly, with $m_2 = 0.60$ kg, we find $T_2 = \frac{5}{6} m_2 g = 4.9$ N.