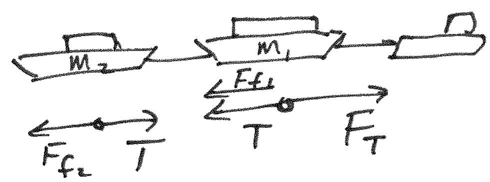
Chapter 6 — Problem 100

~~$m_1 = 2.00\times10^3\,kg$~~
~~$m_2 = 3.00\times10^3\,kg$~~



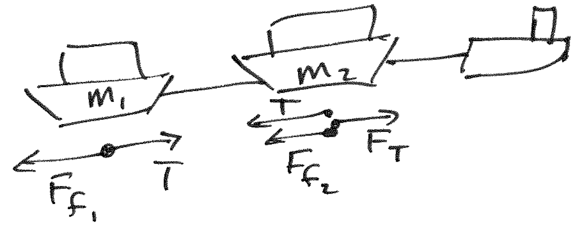
(See problem 99)

$F_T = 20.0\times10^3\,N$

$F_{f_1} = 8.00\times10^3\,N \qquad m_1 = 2.00\times10^3\,kg$

$F_{f_2} = 10.0\times10^3\,N \qquad m_2 = 3.00\times10^3\,kg$

For this problem the order of the barges is reversed



From the free-body diagram

for barge #1

$\Sigma F = ma$

$-F_{f_1} + T = m_1 a$ (#1)

for barge #2

$\Sigma F = ma$

$-F_{f_2} - T + F_T = m_2 a$ (#2)

The unknowns are a & T.

Take (#1) & solve for T

$T = m_1 a + F_{f_1}$ (#3)

Sub into (#2)

$-F_{f_2} - (m_1 a + F_{f_1}) + F_T = m_2 a$

Get accelerations together

$-F_{f_2} - F_{f_1} + F_T = m_1 a + m_2 a$

$$a = \frac{F_T - F_{f_1} - F_{f_2}}{m_1 + m_2} = \frac{20.0\times10^3\,N - 8.00\times10^3\,N - 10.0\times10^3\,N}{2.00\times10^3\,kg + 3.00\times10^3\,kg}$$

$a = \boxed{0.400\,m/s^2}$ This is the same as in problem 99

Now sub into (#3) to get the tension

$T = (2.00\times10^3\,kg)(0.400\,m/s^2) + 8.00\times10^3\,N$

$= 800\,N + 8000\,N = \boxed{8800\,N}$

Notice that this is less than in problem 99.