b) connect bypass stream to rocket engine via

\[ \rho_{L} = \frac{T_{E3}}{T_{0}} \quad \text{and} \quad \rho_{LR} = \frac{T_{ER}}{T_{0}} \]

Recall that energy conservation eqn for mixer (i.e. total enthalpy balance) gives

\[ \frac{T_{E4}}{T_{ER}} = \frac{1 + \chi \frac{T_{E3}}{T_{ER}}}{1 + \chi} \quad (5.97) \]

In notation for this problem

\[ \frac{T_{E4}}{T_{ER}} = \frac{1 + \chi \frac{T_{E3}}{T_{ER}}}{1 + \chi} \]

but

\[ \chi = \frac{1}{\beta} \]

\[ \frac{T_{E4}}{T_{ER}} = \frac{T_{E4}}{T_{E3}} \frac{T_{E3}}{T_{0}} \frac{T_{0}}{T_{ER}} = \gamma_{m} \gamma_{A} \frac{1}{\gamma_{2R}} \]