$P_{oa} = P_a\left(1+\frac{\gamma-1}{2}M^2\right) = 1.524\ atm = P_{o1}$

Try to determine p and T trends first!

$P_{o2} = P_a\left(1+\eta_d\frac{\gamma-1}{2}M^2\right)^{\frac{\gamma}{\gamma-1}} = 1.465\ atm$

$P_{o3} = \frac{P_{o3}}{P_{o2}} \times P_{o2} = 11 \times 1.465 = 16.12\ atm$

$\left(\frac{P_{o5}}{P_{o4}}\right)^{\frac{\gamma-1}{\gamma}} = 1 - \frac{T_a}{\eta_c\eta_t T_{o4}}\left[1+\frac{\gamma-1}{2}M^2\right]\left[\left(\frac{P_{o3}}{P_{o2}}\right)^{\frac{\gamma-1}{\gamma}}-1\right] = 0.939 \rightarrow \frac{P_{o5}}{P_{o4}} = .347 \rightarrow P_{o5} = 5.31\ atm = P_{o6}$

T:

$T_{oa} = T_a\left(1+\frac{\gamma-1}{2}M^2\right) = 288\left[1+(.2)(.8)^2\right] = 325°K = T_{o2}$

$\frac{T_{o3}}{T_{o2}} = 1+\frac{1}{\eta_c}\left[\left(\frac{P_{o3}}{P_{o2}}\right)^{\frac{\gamma-1}{\gamma}}-1\right] = 2.07 \rightarrow T_{o3} = 672.5°K$ $\quad T_{o4} = 1400°K\ (given)$

$T_{o5} = T_{o4}\left\{1-\eta_t\left[1-\left(\frac{P_{o5}}{P_{o4}}\right)^{\frac{\gamma-1}{\gamma}}\right]\right\} = 1052°K = T_{o6}$

$f = \frac{T_{o4}/T_{o3}-1}{\frac{Q_R}{C_p T_{o3}} - \frac{T_{o4}}{T_{o3}}} = \frac{1400/672-1}{\frac{10200}{.24\times672}-\frac{1400}{672}} = 0.177$

$V = M\sqrt{\gamma RT} = 272\ m/s$

$V_e = \sqrt{2C_pT_{o6}\eta_n\left[1-\left(\frac{P_a}{P_{o6}}\right)^{\frac{\gamma-1}{\gamma}}\right]} = \sqrt{2\times.24\times4185\times1052\times.96\left[1-\left(\frac{1}{5.3}\right)^{\frac{.4}{1.4}}\right]} = 877\ m/s$

$\frac{T}{\dot{m}_a} = (1+f)V_e - V = 621\ m/s$

$TSFC = \frac{f}{T/\dot{m}_a} = \frac{.0177}{621}\times3600 = 0.103\ kg/N\cdot hr$

$T = \frac{D}{L}W = \frac{1}{5}\times15 = 3\ Ton = 29400N$ $\quad T_{Per\ Engine} = 14700\ N$ #

(2) ($f_1 = .02$

$P_{oa} = P_a\left(1+\frac{\gamma-1}{2}M^2\right) = 1.524\ atm = P_{o1}$

Try to determine p and T bends first!

$P_{o2} = P_a\left(1+\eta_d\frac{\gamma-1}{2}M^2\right)^{\frac{\gamma}{\gamma-1}} = 1.465\ atm$

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$\left(\frac{P_{o5}}{P_{o4}}\right)^{\frac{\gamma-1}{\gamma}} = 1 - \frac{T_a}{\eta_c\eta_t T_{o4}}\left[1+\frac{\gamma-1}{2}M^2\right]\left[\left(\frac{P_{o2}}{P_{o1}}\right)^{\frac{\gamma-1}{\gamma}}-1\right] = 0.739 \rightarrow \frac{P_{o5}}{P_{o4}} = .347 \rightarrow P_{o5} = 5.31\ atm = P_{o6}$

T:

$T_{oa} = T_a\left(1+\frac{\gamma-1}{2}M^2\right) = 288\left[1+(.2)(.8)^2\right] = 325^\circ K = T_{o2}$

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$T_{o5} = T_{o4}\left\{1-\eta_t\left[1-\left(\frac{P_{o5}}{P_{o4}}\right)^{\frac{\gamma-1}{\gamma}}\right]\right\} = 1052^\circ K = T_{o6}$

$f = \frac{T_{o4}/T_{o3}-1}{\frac{Q_R}{C_p T_{o3}} - \frac{T_{o4}}{T_{o3}}} = \frac{1400/672-1}{\frac{10200}{.24\times672}-\frac{1400}{672}} = 0.177$

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(2) $f_1 = .02$