

ME466 Aeropropulsion Systems

Homework #1 Solutions

(1)

$$\eta_o = \eta_p \eta_T \quad (1-17)$$
$$\frac{V_o}{\text{TSFC} \cdot h_{PR}} \quad (1-19)$$
$$\text{TSFC} = \frac{V_o}{\eta_p \eta_T h_{PR}} \quad (1-20)$$

(2)

10 km (Example 1.1)

8 km

From Standard Air (Appendix A), $\rho = 0.526 \text{ kg/m}^3$

For $M=0.8$, $V_o=246.5 \text{ m/s}$.

Therefore, with nozzle area remains the same, $\dot{m} = 58.92 \text{ kg/s}$.

From the equations, we get

$ST=850.3 \text{ m/s}$ (when \dot{m}_f is not included)

$TSFC=53 \text{ mg/(Ns)}$

$V_e=1049 \text{ m/s}$

$\eta_T = 28.25\%$

$\eta_P = 38.46\%$

$\eta_o = 10.86\%$

12 km

$ST=1494.8 \text{ m/s}$

$TSFC=53 \text{ mg/(Ns)}$

$V_e=1603.87 \text{ m/s}$

$\eta_T = 40.11\%$

$\eta_P = 25.9\%$

$\eta_o = 10.4\%$