PART B

Wednesday, March 24, 2021 1:29 PM

$$\left.\frac{N_c}{\sqrt{\theta_2}}\right)_{des} = 60000/(324.864/288) = 53191.489 \text{ RPM}$$

$$.76\left.\frac{N_c}{\sqrt{\theta_2}}\right)_{des} = 40425.532 \text{ RPM}$$

$$\pi_c = .55\pi_{c\,des} = 1.5 \times .55 = 8.25 \Rightarrow \eta_c = .825$$

$$\dot{m}_{corr2} = .6175\,\dot{m}_{corr2_D} = .746 \cdot .6125 = .457 \text{ kg/s}$$

$$\tau_c = 1 + \frac{\pi_c^{\frac{\gamma-1}{\gamma}} - 1}{\eta_c} = 2.00296$$

$$\frac{N_t}{\sqrt{\theta_4}} = \frac{\dot{m}_{corr2}}{\dot{m}_{corr4}}\frac{1}{\pi_c}\frac{N_c}{\sqrt{\theta_2}} = 20924.878$$

$$\sqrt{\frac{T_{t4}}{T_{t2}}} = 1.932 \Rightarrow T_{t4}/T_{t2} = 3.732$$

$$\tau_t = 1 - \frac{T_{t2}}{T_{t4}}(\tau_c - 1) = .731$$

$$\dot{m}_{corr4}\frac{N_t}{\sqrt{\theta_4}} = 2238.962$$

$$\eta_t = \frac{1-\tau_t}{1-\pi_t^{\frac{\gamma-1}{\gamma}}}, \quad \eta_t = .9$$

$$\pi_t = \left(1 - \frac{1-\tau_t}{\eta_t}\right)^{\gamma/(\gamma-1)} = .289$$

$$\frac{\dot{m}_{corr2}}{\dot{m}_{corr2}} = .800875$$

$$\sqrt{\frac{T_{t4}}{T_{t2}}\tau_t}\,\frac{1}{\pi_c\pi_t} = .692$$