
PROBLEM 6-12N QUESTION

Complex Brayton Cycle With Regeneration, Pressure Loss, And Real Machines

Consider a helium Brayton Cycle with regeneration, pressure losses, and real machines. These are characterized by the following parameters:

$$\zeta = 0.92$$

$$\beta = 1.025$$

$$\eta_t = \eta_c = 0.92$$

The cycle operates at a pressure ratio of $r_p = 2.2$ between limiting temperatures of 303 K and 1083 K. For helium:

$$\gamma = 1.66$$

$$c_p = 5.230 \text{ kJ/kg K}$$

For this cycle, find the thermal efficiency, η_{th} .