$$\eta_{dual} = 1 - \frac{1}{r^{k-1}}\left[\frac{\beta\alpha^{k} - 1}{(\beta - 1) + k\beta(\alpha - 1)}\right] \quad , \quad Mep_{dual} = \frac{P_1 r^{k} \eta_{dual}}{(k-1)(r-1)}\left[(\beta - 1) + k\beta(\alpha - 1)\right]$$

$$\eta_I = \frac{W_I}{Q} = \frac{IP}{Q_c m_f} \ ,$$

$$F = \frac{m_f}{m_a} \quad , \qquad IP = BP + FP \quad , \quad \eta_{mec} = \frac{BP}{IP} = \frac{Bmep}{\mathrm{Im}ep}$$

$$BSFC = \frac{m_f}{BP}, \ \eta_v = \frac{n\dot{m}_a}{NV_D \rho_a}, \ R_{air} = 287 J/kgK, \quad C_p = 1008 J/kgK, \ C_v = 721 J/kgK$$

$$\eta_I = \eta_B + \eta_F, \qquad \eta_B = \frac{BP}{Q_c m_f}, \quad m_f = Fm_a, \qquad \bar{U}p = 2SN$$