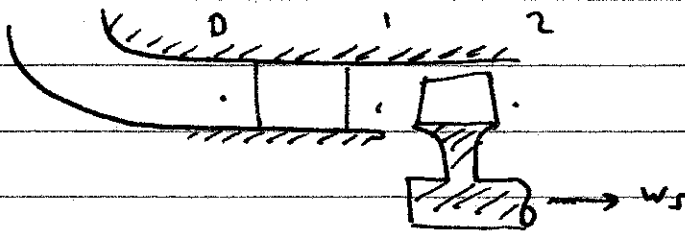


Quiz T2

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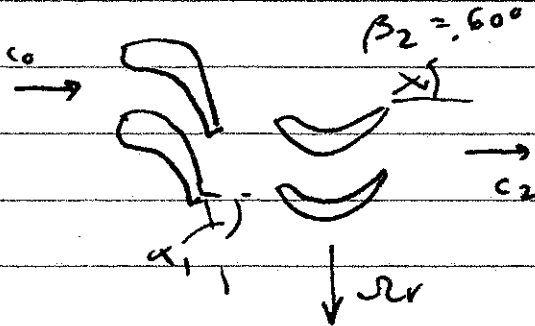
$T_{t0} = 300K$

$r = 0.3m$

$P_{t0} = 2bar$

$\Delta s_{stat} / R = 0.1$

$w_s = 5000 \text{ m/s}$

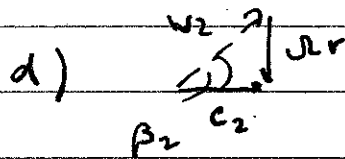
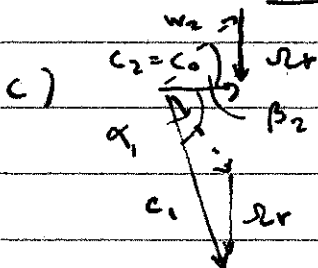


$c_0 = c_2 = c_{x0} = c_{x1} = c_{x2} = 500 \text{ m/s}$

a) 1st law: (no heat, no work) $h_{t2} = h_{t0} \rightarrow T_{t1} = 300K$

b) Gibbs: $T_{t1} ds = dh_{t1} - v dp_{t1}$ $\frac{\Delta s_{01}}{R} = -\ln\left(\frac{P_{t1}}{P_{t0}}\right) \rightarrow P_{t1} = P_{t0} e^{-\frac{\Delta s_{01}}{R}}$

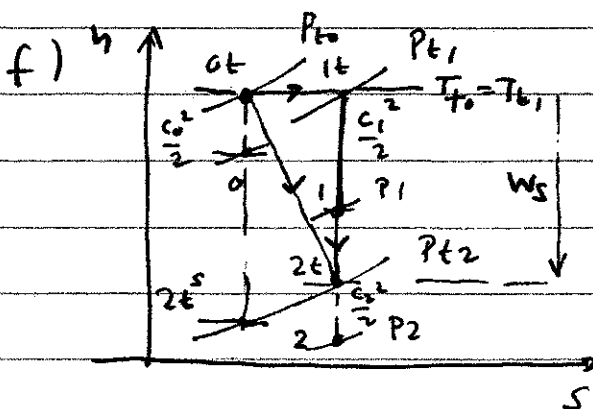
find $P_{t1} = 1.81 \text{ bar}$



$w_r = c_2 \tan \beta_2$

$w = \frac{c_2 \tan \beta_2}{r} = 288.7 \text{ rad/s}$

e) Euler: $h_{t2} - h_{t1} = w_r (c_{\theta 2} - c_{\theta 1})$
 1st law: $h_{t1} - h_{t2} = w_s (w)$
 $c_{\theta 1} = \frac{w_s}{w_r} = 5773 \text{ m/s}$
 $\alpha = \arctan\left(\frac{c_{\theta 1}}{c_{x1}}\right) = 85^\circ$



g) $T_{t2} = T_{t1} - \frac{w_s}{\eta} = 250.2K$

$P_{t2} = P_{t1} \left(\frac{T_{t2}}{T_{t1}}\right)^{\frac{\gamma}{\gamma-1}} \rightarrow P_{t2} = 0.96 \text{ bar}$

h) $T_{t2} = T_{t0} \left(\frac{P_{t2}}{P_{t0}}\right)^{\frac{\gamma-1}{\gamma}} = 243.2K$

$\eta_{ad}^T = \frac{T_{t0} - T_{t2}}{T_{t0} - T_{t2s}}$

$\eta_{ad}^T = 0.877$