"Turbo"
"HW3 P1"
"Zhaoyi Jiang(.1364)"

"Velocity Triangle"
cz=270[m/s]
u=320[m/s]
alpha_1=alpha_3
alpha_2=65[degree]
alpha_3=-15[degree]
c1=c3
w1=w3
beta_1=beta_3
c2=cz/**cos**(alpha_2)
w2=((c2***sin**(alpha_2)-u)^2+cz^2)^.5
beta_2=**arccos**(cz/w2)
c3=cz/**cos**(alpha_3)
w3=((c3***sin**(alpha_3)-u)^2+cz^2)^.5
beta_3=-**arccos**(cz/w3)

"Degree of reaction and utilization"
R=(w3^2-w2^2)/((c2^2-c1^2)+(w3^2-w2^2))
epsilon=(c2^2-c3^2)/(c2^2-R*c3^2)

"Work"
W=u*(cz***tan**(alpha_2)-cz***tan**(alpha_3))*****convert**(m,km)

"Efficiency"
p1=5[bar]
p2=2[bar]
p3=1.4[bar]
t1=740[k]
h1=**enthalpy**(***Air***,***T***=t1)
s1=**entropy**(***Air***,***T***=t1,***P***=p1)
s1=s3ss
h3ss=**enthalpy**(***Air***,***s***=s3ss,***P***=p3)
h01=h1+c1^2/2*****convert**(m,km)
h01=h02
W=h02-h03
eta_ts=(h01-h03)/(h01-h3ss)
h03ss=h3ss+c3^2/2*****convert**(m,km)
eta_tt=(h01-h03)/(h01-h03ss)

"Velo loss coeff"
h02=h2s+c2s^2/2*****convert**(m,km)
phi=c2/c2s
psi=cz/u

"Static enthalpy loss coeff"
h2s=**enthalpy**(***Air***,***P***=p2,***s***=s1)
h02=h2+c2^2/2*****convert**(m,km)
s2=**entropy**(***Air***,***h***=h2,***P***=p2)
s2=s3s
h3s=**enthalpy**(***Air***,***s***=s3s,***P***=p3)
h03=h3+c3^2/2*****convert**(m,km)
zeta_s=(h2-h2s)/(0.5*c2^2)*****convert**(km,m)
zeta_r=(h3-h3s)/(0.5*w3^2)*****convert**(km,m)

SOLUTION
**Unit Settings: SI K bar kJ mass deg**

$\alpha_1$ = -15 [degree]
$\beta_1$ = -55.47 [degree]
c1 = 279.5 [m/s]
c3 = 279.5 [m/s]
$\eta_{ts}$ = 0.7777
h02 = 795.9 [kj/kg]
h1 = 756.8 [kj/kg]
h3 = 548.4 [kj/kg]
p1 = 5 [bar]
$\phi$ = 0.982
s1 = 6.174 [kj/kg-k]
s3ss = 6.174 [kj/kg-k]
W = 208.4 [kj/kg]
w3 = 476.3 [m/s]

$\alpha_2$ = 65 [Degree]
$\beta_2$ = 43.81 [degree]
c2 = 638.9 [m/s]
cz = 270 [m/s]
$\eta_{tt}$ = 0.9104
h03 = 587.4 [kj/kg]
h2 = 591.8 [kj/kg]
h3s = 534.7 [kj/kg]
p2 = 2 [bar]
$\psi$ = 0.8438
s2 = 6.187 [kj/kg-k]
t1 = 740 [K]
w1 = 476.3 [m/s]
$\zeta_r$ = 0.1206

$\alpha_3$ = -15 [Degree]
$\beta_3$ = -55.47 [degree]
c2s = 650.6 [m/s]
$\varepsilon$ = 0.8422
h01 = 795.9 [kj/kg]
h03ss = 566.9 [kj/kg]
h2s = 584.2 [kj/kg]
h3ss = 527.8 [kj/kg]
p3 = 1.4 [bar]
R = 0.2083
s3s = 6.187 [kj/kg-k]
u = 320 [m/s]
w2 = 374.2 [m/s]
$\zeta_s$ = 0.03699

No unit problems were detected.