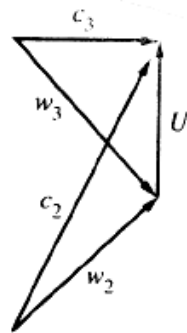


(Add a short summary of the concepts you are using to solve the problem)

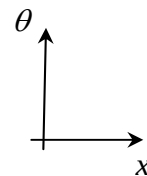
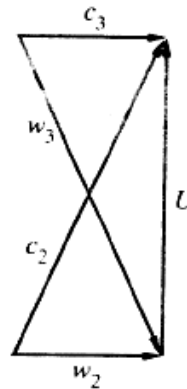
Problem T16

Consider the velocity triangles below for an impulse turbine and for a reaction turbine at different rotor speeds. The subscripts 2 and 3 denote conditions before and after the rotor, respectively. In both cases the absolute velocity c_2 is 400 m/s at an angle $\alpha_2 = 70^\circ$, and the absolute exhaust velocity c_3 is axial. For the impulse turbine the tangential relative velocity components into and out of the rotor $w_{\theta 2}$ and $w_{\theta 3}$ are of the same magnitude. The blades are uncooled and well insulated from the turbine disc such that the flow can be assumed adiabatic. The rotor inlet stagnation temperature is $T_{t2} = 1100\text{K}$.

Impulse Turbine



Reaction Turbine



- Assuming that the flow into the guide vane is axial, sketch the guide vane and rotor blade profiles for the two turbines.
- What is the wheel speed U for the impulse turbine? What is it for the reaction turbine?
- What is the specific work in kJ/kg for the two turbines?
- What is the change in stagnation temperature across the rotor for the two turbines?
- What is the change in static temperature across the rotor for the two turbines?