

AAE 4660 Aeropropulsion Systems

HW # 2

Fall 2009

Due: Monday, October 5, 2009

1. Air with a density of 0.027 lbm/ft^3 enters a diffuser at a velocity of 2470 ft/s and a static pressure of 4 psia . The air leaves the diffuser at a velocity of 300 ft/s and a static pressure of 66 psia . The entrance area of the diffuser is 1.5 ft^2 , and its exit area is 1.7 ft^2 . Determine the magnitude and direction of the strut force necessary to hold the diffuser stationary when this diffuser is operated in an atmosphere of 4 psia .
2. Air at 1400K , 8 atm , and 0.3 Mach expands isentropically through a nozzle to 1 atm . Assuming a calorically perfect gas, find the exit temperature and the inlet and exit areas for a mass flow rate of 100 kg/s .
3. Air at 518.7°R is isentropically compressed from 1 to 10 atm . Assuming a calorically perfect gas, determine the exit temperature and the compressor's input power for a mass flow rate of 150 lbm/sec .