

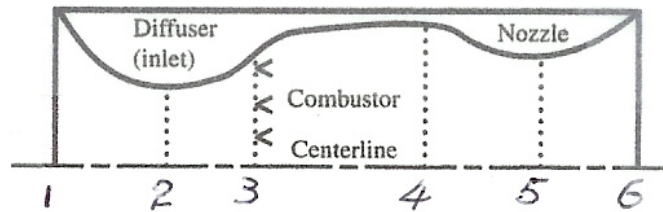
AAE 4660 Aeropropulsion Systems

HW # 3

Fall 2009

Due: Monday, Oct 19, 2009

1. An ideal ramjet shown below is operated at 50,000-ft altitude with a flight Mach of 3. The diffuser and nozzle are assumed to be isentropic, and the combustion is to be modeled as an ideal heat interaction at constant Mach number with constant total pressure. For $T_{t4}=4000^{\circ}\text{R}$ and full expanded nozzle,
 - (a) Determine the mass flow rate of air through the engine in lbm/s,
 - (b) Complete the table below,
 - (c) Find the thrust force of the diffuser, combustor, nozzle, and the ramjet engine.



Station:	1	2	3	4	5	6
Area (ft ²)	4.235					
Mach	3	1	0.15	0.15	1	3
P (psia)						
T (°R)						
V (ft/sec)						

2. Air flow through a turbine with the stagnation temperature changes isentropically from 1970°R to 850°R with a mass flux of 251 lbm/s. Use 1.3 for the specific heat ratio and gas constant of 1716 [ft lbf/(slug °R)]. Find the amount of power, in Btu/s, W, and (ft lbf/s), removed from the gas by the turbine.