Code No: NR312104 **NR**

III B.Tech I Semester Supplementary Examinations, May 2005
GAS DYANAMICS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive the expression for stagnation to static ratio for pressure, temperature and density in the case of isentropic flow.

2. Air at 300 K and $1 \times 10^5 N/m^2$ enters a diffuser with a velocity of 245m/s. The diffuser is to be designed to reduce the velocity of air to 60 m/s. The mass flow rate through the diffuser is 13.6 Kg/s. Assuming the flow to be isentropic, determine the Inlet diameter, outlet diameter and rise in static temperature.

3. Derive the expression for the Mach number downstream of a oblique shock in terms of upstream Mach number (M1).

4. The ratio of exit to the entry area in a subsonic diffuser is 3.8. The mach number of a jet of air, entering the diffuser at P_0 = 1.02 bar, T = 296 K is 2.2. There is standing normal shock just outside the diffuser entry The flow in the diffuser is isentropic. Determine Mach number Temperature and Pressure at the exit of the diffuser. Also find the stagnation pressure loss between the initial and final stages of the flow?

5. Determine the expressions for the stagnation pressure ratio, stagnation temperature ratio, density ratio and change in entropy in the case of a flow through a constant area duct with heat transfer.

6. Define shock polar. Draw shock polar for different Mach numbers. How do the strong and weak affect the flow.

7. A normal shock wave moves at a constant speed of 500m/s in to air at 0^0C and 0.7 atm. Determine the static and stagnation conditions present in the air after passage of wave.

8. An under expanded, 2-D supersonic nozzle exhausts in to a region, where p = 240 mm of mercury (suction). Flow at nozzle exit plane is uniform with p = 275mm of mercury and M = 2.0. Determine the flow direction and Mach number after the initial expansion.

⋆ ⋆ ⋆ ⋆ ⋆