B.E / B.Tech DEGREE END SEMESTER EXAMINATIONS, APR /MAY 2011

MECHANICAL ENGINEERING BRANCH

FIFTH SEMESTER - (REGULATIONS 2004)

ME 371 – GAS DYNAMICS AND JET PROPULSION

Time : 3 hr Max Mark : 100

Answer ALL questions

Part A – (10 × 2 = 20 mark)

1. Define stagnation pressure?
2. How sound wave is different from a shock wave?
3. Write down the adiabatic energy equation.
4. State the assumptions used in Rayleigh flow.
5. Give applications of Fanno flow?
6. Why are expansion shocks impossible?
7. What do you mean by oblique shock wave?
8. Define Propulsive efficiency.
9. Give an example for a bi-propellant?
10. Define escape velocity

Part B – (5 × 16 = 80 mark)

11.a) i The jet of a gas at 400 K (γ = 1.4 R = 287 J/ kg.K)has a Mach number of 1.2. Determine for local and stagnation conditions velocity of sound and enthalpy. And also get the Maximum attainable velocity of this jet? **(10)**

ii Describe the behavior of flow in convergent nozzle for various back pressure **(6)**

12.a) Air at P_0=10 bar,T_0= 450 K is supplied to a 25 mm diameter pipe. The friction factor for the pipe surface is 0.005. The inlet mach number is 2.5 and it is changed to 1.0 at the exit determine (i) the length of the pipe (ii) the mass flow rate

(Or)

b) Explain the theory of Rayleigh flow. State the assumptions used and the governing equations of flow. Also represent the Rayleigh flow in T-s and p-v diagram.

13.a) The stagnation pressure and temperature of air at the entry of a nozzle are 5 bar and 400K respectively. The exit Mach number is 2 where a normal shock occurs. Calculate the following quantities before and after the shock: static and stagnation temperatures and pressures, air velocities and mach numbers. What are the values of stagnation pressure loss and increase in entropy across the shock?

(Or)