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2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
GAS DYNAMICS
(AERONAUTCAL ENGINEERING)

NOVEMBER 2005

TIME – 3 HOUR
MARK - 80

Answer any FIVE Questions
All Questions carry equal marks

1. Ambient air at an altitude of 6500m above sea level enters the engine of an aircraft flying at 100m/s. If the mass flow of air is 30 Kg/s determine the diameter of the inlet duct of the engine, state the assumptions used. [16]

2. Describe the behavior of a convergent-divergent nozzle at pressure ratios which are below, equal and above the design pressure ratio. [16]

3. What is the strength of a shock called? How is it measured and find the expression for the strength of a shock. [16]

4. Gas enters in a combustion chamber with static pressure and static temperature and velocity of 0.35 bar, 315 K and 60m/s respectively. Determine these properties at the exit. Also find the Mach number at the exit. The increase in enthalpy of the gas in the combusion chamber is 1175 kJ/kg. [16]

5. Calculate the pressure required in the driver section of a shock tube to produce a shock of M = 5.0 in the driven section which contain air at an initial temperature of 27oC and pressure 0.01 atm. If the driver gas is air at 27oC: =1.4, R = 287m2/s2K. [16]

6. Show that the upper and lower parts of the Fanno curve represent subsonic and supersonic flow respectively. Find the point of maximum entropy and show the Mach number at this point. [16]

7. Define shock polar. Draw shock polar for different Mach numbers. How do the strong and weak shocks affect the flow. [16]

8. Air at 300 K and 1X105 N/M2enters 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. [16]

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