JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-2006
III B.TECH I SEMESTER REGULAR EXAMINATIONS
AERO SPACE PROPULSION-I
(AERONAUTICAL ENGINEERING)

NOVEMBER 2006

TIME-3HOUR
MARKS-80

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS.

1. Consider an air standard Brayton cycle, where the air enters the compressor at 0.12 Mpa,250 C. It leaves the compressor at 0.5 Mpa. TIT is 10000 C. Determine pressure and temperature at each point in the cycle.Work out the efficiency of its compressor,turbine and the overall engine.

2. A turbo-prop driven airplane is flying at 680 Km / h at an altitude where the ambient conditions are 0.458 bar and -100C. The compressor pressure ratio is 9.5:1 and the turbine inlet temperature is 1250 K. The isentropic efficiencies of compressor and turbine are 0.85 and 0.90 respectively. Assuming that no thrust is generated by the jet exhaust from the engine; calculate the specific power input available to the propeller.

3. Consider a front air intake for a subsonic turbojet airplane as that for He-178 or F-86 Saber jet. Show the internal layout for the air to be swallowed by the engine. Explain its aerodynamics and thermodynamics in details when the airplane dives at higher angles in its flight.

4. Consider a supersonic airplane with Ear type air intakes ahead of the wing root ends on the fuselage. Describe its aerodynamics and thermodynamics at its design Mach number at a small angle of yaw.

5. Enumerate the various factors affecting the performance of a combustion chamber. How 'combustion efficiency' and 'combustion intensity' affect the performance?

6. Find the dimensions and the values of Cfg, Fg and CV of an axisymmetric exhaust- nozzle with a mass flow rate of 75kg/s with the following given data:
Pt8 = 350 kPa Tt8 = 1600K
A9/A8 = 1.8 R = 0.287 kJ/kg.K ? = 1.33
Pt9/Pt8 = 0.98 CD = 0.98 P0 = 40 kPa

7. (a) How do you classify centrifugal compressors? Explain how physically the pressure ratio is achieved in practice. What are the limitations of a centrifugal compressor?

(b) Define and differentiate between 'slip factor' and 'power input factor'.

8. Explain the following with respect to axial flow compressor:

(a) Cascade characteristics

(b) Reynolds and Mach number effects.