III B.Tech I Semester Regular Examinations,Nov/Dec 2009
AEROSPACE PROPULSION-I
Aeronautical Engineering

Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. A centrifugal compressor has an inlet eye 15 cm diameter. The impeller revolves at 20,00 rpm and the inlet air has an axial velocity of 107 m/s, inlet stagnation temperature 294 K and inlet pressure 1.03 kg/cm^2 . Determine:

   (a) Theoretical angle of the blade at this point and.
   (b) Mach number of the flow at the tip of eye.   [16]

2. Enumerate and discuss various types of drag that play a significant role in the design of inlets.   [16]

3. What are different types of nozzles used in aircraft engine? Briefly explain them. [16]

4. Find the polytropic efficiency of an axial flow compressor from the following data:
   The total head pressure ratio: 4
   Overall total head isentropic efficiency: 85 Total head inlet temperature: 290k
   The inlet and outlet air angles from the rotor blades of the above compressor are 10^0 and 45^0 respectively. The rotor and stator blades are symmetrical. The mean blade speed and axial velocity remains constant throughout the compressor. Assuming a value of 220 m/s for blade speed and the work done factor as 0.86, find the number of stages required. Also find the inlet Mach number relative to rotor at the mean blade height of the first stage.
   Assume R=284.6 KJ/Kg K.   [16]

5. Discuss briefly the contingencies experienced due to ignition process inside combustors.   [16]

6. Why is it desirable for a high speed supersonic inlet to produce a series of weak oblique shocks? Explain in detail.

                                                                    [16]

7. (a) Explain advantages, disadvantages, basic characteristics and applications of a Ramjet engine.
   (b) Show that a turbofan with all of its bypassed air mixed into the core flow, results in same thrust equation as for a turbojet.   [8+8]

8. Explain in detail various forms of combustion systems used in aircraft engines with appropriate sketches.   [16]

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