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BAS-016

B.Tech. AEROSPACE ENGINEERING (BTAE)

00132

Term-End Examination

December, 2017

BAS-016 : PROPULSION - II

Time : 3 hours *Maximum Marks : 70*

Note : Attempt any seven questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. Distinguish between turbojet and turbofan engine. Explain the working principle of a turbofan engine with the help of neat and labelled diagram. Derive the equation of thrust for turbofan engine. 3+4+3

2. (a) Explain the flow through converging-diverging nozzle for different back pressures with the help of neat sketches. 5

   (b) What is the purpose of an inlet ? Distinguish between subsonic and supersonic inlet. 2+3

3. Distinguish between axial flow compressor and axial flow turbine. Derive the expression for free vertex design for an axial flow compressor. 4+6

4. Write notes on the following : 5+5

   (a) Blade cooling and various methods

   (b) Axial flow turbine characteristics with the help of plots

5. Derive expression for degree of reaction for a typical axial flow turbine stage in terms of blade angle and flow coefficient with the help of velocity triangles. when will the velocity triangles become symmetrical ? Also define degree of reaction and its importance. 6+2+2

6. Distinguish between ramjet and scramjet. Explain the working principle of a ramjet with the help of a neat and labelled diagram. Derive the equation of thrust for ramjet engine. 3+4+3

7. (a) Calculate the pressure ratio of a single sided centrifugal compressor and power required to drive it using following data. 6

Power input factor = 1.09

Slip factor = 0.8

Rotational speed = 290 m/s

Overall impeller diameter = 0.6 m

Air mass flow = 12 kg/sec

Inlet stagnation temperature = 300 K

Isentropic efficiency = 0.9

(b) Write a note on compressibility effects in compressor. 4

8. (a) Explain the combustion process in a flame tube with the help of a neat sketch. 5

(b) Explain the factors affecting stage pressure ratio of an axial flow compressor. 5

9. Calculate the specific thrust and specific fuel consumption for a simple turbojet engine cruising at an altitude of 10 km and Mach No. of 0.8 **10**

Given compressor pressure ratio = 8

Turbine inlet temperature = 1200 K

Isentropic efficiency of

compressor = 0.87
turbine = 0.90
intake = 0.93
nozzle = 0.95

Mechanical transmission efficiency = 0.99

Combustion efficiency = 0.98

Combustion pressure loss = 4% Comp. deliv. press.

At 10 km, p = 0.265 bar, T = 223.3 K, a = 299.5 m/s, Theoretic a /f ratio = 0.0194