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BAS-016

B. TECH. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2019

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 centrifugal and axial flow compressor. Explain the working principle of centrifugal compressor. Also derive the expression for work done. 10

2. What do you mean by De-Laval nozzle ? Discuss flow through de-laval nozzle for the different flow regimes using neat sketches. 10

3. Distinguish between axial flow compressor and axial flow turbine. Draw velocity triangles for both and explain them. 10

4. Explain the working principle of ramjet engine using neat sketches. Using T-s diagram, derive the expression for exit velocity for ideal ramjet engine. 10

5. Write short notes on the following : 5+5

   (a) Methods of thrust augmentation

   (b) Duplex burner

6. A perfect gas expands in a frictionless nozzle from stagnation condition P_0 = 4 MPa, T_0 = 2500 K to ambient pressure 0.1 MPa. Given that the expansion is isentropic, determine the following conditions at the final pressure :

   (a) Velocity

   (b) Mach number

   (c) Temperature

   (d) Area per unit mass flow

   How does the final flow area compare with throat area for a given mass flow ?

   Given r = 1.4 and molecular weight, M = 30, $\overline{R}$ = 8314.3 J/kg K. 10

7. (a) Discuss the starting problem of a supersonic inlet with the help of sketches. 6

   (b) Describe in brief flame tube cooling. 4

8. A 16 stage axial flow compressor is to have a pressure ratio of 6.3. Tests have shown that a stage total efficiency of 0.9 obtained for first 6 stages and 0.89 for rest of the stages. Assuming the constant work done in each stage and similar stages, find the compressor overall efficiency. For a mass flow rate of 40 kg/s, determine the power required by the compressor. Assume the inlet temperature of 288 K (R = 287 J/kg K, r = 1.4). 10

9. Write short notes on the following : 5+5

   (a) Performance characteristics of axial flow turbine

   (b) Lubrication system