BAS-016

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

December, 2016

□□2◁3

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. (a) With the help of a neat diagram, explain the working principle of Ram Jet Engines.

   (b) Draw neat diagram of the inlet and exit velocity triangle for any one type of blades of centrifugal compressor and explain them.   *5+5*

2. (a) Briefly discuss the application of gas turbines.

   (b) Explain any *two* of the following :
   (i) Blade Mach number
   (ii) Cascade action
   (iii) After burner   *5+5*

3. (a) Differentiate between thrust augmentation and thrust reversal.

   (b) With the help of a neat sketch explain a by-pass engine.   *5+5*

4. (a) Differentiate between centrifugal and axial flow compressors.

   (b) Draw a neat sketch of a jet engine lubrication system and explain it.   *5+5*

5. (a) Explain the phenomenon of compressor surge.

   (b) Discuss the phenomenon of flow through a convergent-divergent nozzle.   *5+5*

6. (a) What is the function of a compressor ? What are the different types of compressors ?

   (b) Define the volumetric efficiency of a compressor. Enlist the factors on which it depends.   *5+5*

7. A turbojet engine inducts 51 kg of air per second and propels an aircraft with a uniform flight speed of 912 km/hr. The isentropic enthalpy change for the nozzle is 200 kJ/kg and its velocity coefficient is 0·96. The fuel-air ratio is 0·0119, the combustion coefficiency is 96% and the lower heating value of the fuel is 10500 kcal/kg. Assume CV = 42 MJ/kg.
    Calculate

    (a) the thermal efficiency of the engine,

    (b) the fuel flow rate in kg/hr and the Thrust Specific Fuel Consumption (TSFC),

    (c) the propulsive power in kW,

    (d) the thrust power, and

    (e) the propulsive efficiency.   *10*

8. A turbojet has a speed of 750 km/hr while flying at an altitude of 10000 m. The propulsive efficiency of the jet is 50% and the overall efficiency of the turbine plant is 16%. The density of air at 10000 m altitude is 0·173 kg/m^3. The drag on the plane is 6250 N. The calorific value of the fuel is 48000 kJ/kg. Calculate the following :   *10*

    (a) Absolute velocity of the jet

    (b) Volume of air compressed per minute

    (c) Diameter of the jet

    (d) Power output of the unit in kW

    (e) Air-fuel ratio

9. The mean diameter of the blades of an impulse turbine with a single row wheel is 105 cm and the speed is 3000 rpm. The nozzle angle is 18° with respect to axial direction, the ratio of blade speed to gas speed is 0·42 and the ratio of the relative velocity at outlet from the blades to that at inlet is 0·84. The outlet angle of the blade is to be made 3° less than the inlet angle. The mass flow rate is 8 kg/sec.

   Calculate the following :   *10*

   (a) Tangential thrust on the blades

   (b) Axial thrust on the blades

   (c) Power produced on the blades

   (d) Blade efficiency

10. Write short notes on any *five* of the following : *5×2=10*

   (a) Blade Cooling

   (b) Air Cooling System

   (c) Flame Stability

   (d) Diffuser in Subsonic Flow

   (e) Angularity Coefficient

   (f) Mach Number

   (g) Zero Percent Reaction Stage

   (h) Choking in Centrifugal Compressor