

**B.Tech. AEROSPACE ENGINEERING  
(BTAE)**

**Term-End Examination**

**June, 2016**

00278

**BAS-016 : PROPULSION – II**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. (a) Explain the working of a turbojet engine with the help of a neat T-s diagram.
- (b) What do you understand by blade and stage efficiency ? 5+5
2. (a) What are the various factors that affect the combustion chamber performance ? Explain.
- (b) Explain any *two* of the following performance coefficients :
  - (i) Nozzle coefficient
  - (ii) Flow coefficient
  - (iii) Velocity coefficient 5+5

3. (a) Why is a conical dome used in jet pipes ?  
Explain.
- (b) With a suitable sketch, explain the working principle of an axial flow compressor. 5+5
4. (a) Write down the 'thrust equation' and explain the various terms used in it.
- (b) With a neat sketch, describe the flow process through a combustion chamber indicating various flow zones. 5+5
5. (a) State the fundamental difference between jet propulsion and rocket propulsion.
- (b) Discuss the advantages of burning overall fuel-air mixture. 5+5
6. (a) What do you understand by choking in nozzle flow ?
- (b) Show that the discharge through a nozzle is maximum when there is a sonic condition at its throat. 5+5
7. (a) Why are diffusers necessary in a centrifugal compressor ? Explain.
- (b) What are the basic requirements of compressors for aircraft applications ? Do axial flow compressors meet them ? Explain. 5+5

8. A turbojet engine flying at a speed of 960 km/hr consumes air at a rate of 54.5 kg/sec.

Calculate :

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- (a) Exit velocity of the jet when the enthalpy change for the nozzle is 200 kJ/kg and velocity coefficient is 0.97.
  - (b) Fuel flow rate in kg/sec when air-fuel ratio is 75 : 1.
  - (c) Thrust specific fuel consumption
  - (d) Thermal efficiency of the plant when the combustion efficiency is 93% and calorific value of the fuel is 45000 kJ/kg
  - (e) Propulsive power
  - (f) Propulsive efficiency
  - (g) Overall efficiency
9. (a) Write down the expression for blade efficiency of a stage of an impulse turbine with single row wheel, assuming equiangular blades.
- (b) What is the maximum efficiency at a nozzle angle of  $20^\circ$ , if the blade velocity coefficient is 0.83 ? If the blade efficiency is to be 90% of the maximum value, what are the possible ratios of the blade speed to gas speed ?

5+5

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

- (a) Flame tube cooling
  - (b) Pollution in combustion system
  - (c) Knocking
  - (d) After burner
  - (e) Blade cooling
  - (f) Fifty percent reaction stage
  - (g) Roto pressure flow coefficient
  - (h) Impeller
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