

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Aeronautical Engineering

AE 2304/AE 1351/AE 71/080180029/10122 AE 504 — PROPULSION — II

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Gas tables may be permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the difference between impulse turbine and reaction turbine?
2. State any two limiting factors in gas turbine design.
3. How ramjet engine differs from turbojet engine?
4. Define supercritical operation of ramjet.
5. What are the internal ballistics factors in rockets?
6. How rocket nozzles are classified?
7. What are the hardware components of solid propellant rockets?
8. Define hybrid rocket.
9. State the types of nuclear rockets.
10. Define nozzle-less propulsion.

11. (a) (i) Explain about the choice of blade profile, pitch and chord in aircraft gas turbine blade selection. (8)
- (ii) Explain the various methods of blade cooling in gas turbines. (8)

Or

- (b) Air enters the two stage axial flow turbine at a total temperature of 1400K and a total pressure of 2230 KPa. The actual work developed by each stage is 185 KJ/Kg, and each stage has an adiabatic efficiency of 87%. Calculate (i) The total pressure at the exit from each stage and (ii) The overall adiabatic efficiency.
12. (a) Explain the critical, subcritical and supercritical operation of ramjet with neat sketch.

Or

- (b) A ramjet is travelling at Mach 3 at an altitude of 5000 m, the external static pressure and temperature be 258 K and 60 KPa respectively. The calorific value of fuel is 46520 KJ/Kg. The mass flow rate of air is 45 kg/s. The burner exit total temperature is 1950 K. Find the thrust, air fuel ratio and Thrust Specific Fuel Consumption (TSFC). Assume $\gamma = 1.4$.
13. (a) Explain the various types of rocket nozzles with neat sketches.

Or

- (b) A rocket nozzle has a throat area of 20 cm² and a combustion chamber pressure of 25 bar. If the specific impulse of nozzle is 127 seconds and weight flow rate is 45N/s. Determine (i) Thrust coefficient, (ii) Propellant weight flow coefficient, (iii) Specific propellant consumption and (iv) Characteristic velocity.
14. (a) (i) Explain the working principle of solid propellant rocket with neat sketch. (8)
- (ii) Explain about propellant grain design considerations. (8)
- Or
- (b) (i) Explain the cooling in liquid propellant rockets. (8)
- (ii) Explain the selection criteria of liquid propellants. (8)
15. (a) Explain the Electric rocket propulsion with neat sketch.

Or

- (b) Explain the Nuclear rocket propulsion with neat sketch.