Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(S), OCTOBER 2019

Course Code: ME462
Course Name: PROPULSION ENGINEERING

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three full questions, each carries 10 marks.
Marks

1 (a) Distinguish between air breathing engines and rocket engines. Give examples. (7)

  (b) What are applications of rocket engines. (3)

2 (a) Discuss the working of turboprop engine. (7)

  (b) Why the use of turboprop engines is limited to aircrafts having flight speed less than about 700 km/hour? (3)

3 (a) Derive an expression for finding out the thrust developed by a jet engine. (7)

  (b) What is the effect of flight speed on the thrust power of a jet engine. (3)

4   A turbojet inducts 50 kg/s of air and propels an aircraft at a flight speed of 900km/hr. The isentropic enthalpy change for the nozzle is 200 kJ/s and velocity coefficient is 0.94. The fuel air ratio is 0.012. The calorific value of fuel is 45 MJ/kg. Calculate (i) thermal efficiency (ii) Thrust power (iii) propulsive efficiency (iv) overall efficiency (10)

PART B
Answer any three full questions, each carries 10 marks.

5 (a) What are the various components of turbojet engine? Explain the need of each component in detail (6)

  (b) What are the limitations of thrust augmentation of turbojet engines? (4)

6 (a) Explain the following phenomenon happened in the axial flow compressor (a) surging (b) chocking (c) stalling? Also explain the effects of these phenomenon on the working of axial flow compressor (10)

7 (a) What are the various types of rocket propulsion system? (4)

  (b) Calculate the thrust, specific impulse, propulsive, thermal and overall efficiency of rocket engine from the flowing data: Effective jet velocity=1250 m/sec, flight to jet speed ratio=0.8, oxidizer flow rate=3.5 kg/sec, fuel flow rate=1 kg/sec, heat of reaction per kg of exhaust gases=2500 kJ/kg (6)

8 (a) What are hypergolic propellants? List out the various hypergolic propellants (3)

  (b) Define the propulsive efficiency and thermal efficiency of rocket propulsion (3)

system

(c) What is restrictive and unrestrictive modes burning of solid propellant. (4)

PART C
Answer any four full questions, each carries 10 marks.

9 (a) Explain the working of pressure-fed and pump-fed LPR? (6)

(b) Explain the working of pyrogen igniter. (4)

10 (a) List out any 5 desirable properties of a liquid propellant (5)

(b) What do you mean by Combustion instability in Rocket engines (5)

11 Explain the different methods of cooling of thrust chambers and nozzles in Liquid propellant Rocket engine. (10)

12 A rocket-propelled vehicle has a mass ratio of 0.10. The specific impulse of the rocket is 2500Ns/kg. If the rocket burns for 60s, find the velocity and altitude attained by the vehicle. Assume vertical trajectory and negligible drag, g=9.81 m/s^2. (10)

13 (a) Explain the major components of a typical rocket test facility. (6)

(b) Explain the safety provisions in a modern rocket test facility. (4)

14 (a) Derive an expression for altitude gain in a powered flight. (6)

(b) List out at least eight physical quantities measured in rocket testing. (4)

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