

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth semester B.Tech degree examinations, September 2020

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

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| 1 | a) Explain the working of turbofan engine with a neat sketch | (7) |
| | b) Which are the advantages of turbo-prop Engine | (3) |
| 2 | a) Derive the expression with a neat sketch for the jet thrust of turbojet engine | (7) |
| | b) What is mean by effective jet velocity? | (3) |
| 3 | a) Distinguish between the Air breathing engines with non breathing Engines.
Give some examples. | (5) |
| | b) Explain the working principle of Propellers and Jet engines. | (5) |
| 4 | An aircraft flies at a speed of 925 kmph. A turbojet engine takes 35kg/s of air and the gases are expanded to ambient pressure .The air fuel ratio is 50 and the lower calorific value of the fuel is 43MJ/kg. For the maximum thrust power, Determine (a) Jet velocity (b) Thrust (c) Specific Thrust (d) Thrust power (e) Propulsive efficiency (f) Thermal efficiency (g) Overall efficiency | (10) |

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

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| 5 | a) Which are the components of Turbojet Engine? Explain their functions | (6) |
| | b) Which compressor is used for high speed high range aircraft engines? Why | (4) |
| 6 | a) Explain the different Thrust augmentation methods. | (5) |
| | b) Classify the types of air intakes? How the air intakes works? | (5) |
| 7 | a) Explain about the working of nuclear rocket with a neat sketch. | (5) |
| | b) What are the factors affecting the linear burning rate in solid propellant rocket. | (5) |
| 8 | A rocket has the following data: fuel flow rate is 3.5kg/s, oxidiser flow rate is 1.2kg/s, Nozzle exit diameter is 120mm, Nozzle exit pressure is 1.03bar, ambient pressure is 1.013 bar, Thrust chamber pressure is 25 bar and Thrust is 6000N. Determine i) Effective jet velocity ii) Actual jet velocity iii) Specific impulse and specific propellant consumption | (10) |

PART C

Answer any four full questions, each carries 10 marks.

- 9 Explain the combustion instability in rocket engines? How it can be controlled (10)
- 10 Explain the working of propellant feed systems in liquid propellant rocket (10)
- 11 Which are the types of injectors used in liquid propellant rockets. (10)
- 12 a) Which are the test to be conducted for the rocket components before they put into operation? (5)
- b) Describe about the flight testing. (5)
- 13 Derive the rocket equation in Gravity free Drag free flight. (10)
- 14 A two stage rocket is used to pull up a payload of 500kg mass in a particular orbit. The approximate value of the mass of propellant, mass structure and jet velocity for each stage is given below. (10)

Stage	First	Second
Mass of propellant(kg)	9500	3500
Mass of structure including inerts(kg)	2500	500
Jet velocity(m/s)	1750	2000

Determine: i) Payload mass fraction of the total rocket ii) ideal change in velocity provided by each stage and the total velocity iii) If the first stage fires for period of 60 sec and the rate of mass depletion assumed to be constant find the acceleration of the rocket at take-off.
