PAPER ID-420546

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
GAS DYNAMICS AND JET PROPULSION

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

Qno.	Question	Marks	CO
a.	Define Rocket propulsion.	2	5
b.	What is meant by gas dynamics?	2	1
c.	Classify the Rocket-Engines.	2	4
d.	What is Fano-Flow?	2	3
e.	Define Propulsive efficiency.	2	4
f.	What is the type of compressor used in turbo jet?	2	5
g.	Explain Mach cone.	2	3
h.	Distinguish between Mach wave and normal shock.	2	3
i.	What is nozzle?	2	1
j.	What are the types of rocket engines?	2	4

SECTION B

2. Attempt any *three* of the following:

Qno.	Question	Marks	CO
a.	Differentiate between Rayleigh and Fano flows	10	3
b.	Explain the Types of rocket engines with neat diagram.	10	5
c.	Write a Short on space flights.	10	4
d.	Explain the rocket turbo pump feed system, ignition system and combustion system.	10	4
e.	A rocket nozzle has a throat area of 18$cm^2$and combustor pressure of 25bar. If the specific impulse is 127.42sec and the rate of flow of propellant is 44.145N/s, determine the thrust coefficient, propellant weight flow coefficient, specific propellant consumption and characteristic velocity.	10	4

SECTION C

3. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	How is turbofan engine differ from turbo prop engine?	10	4
b.	A ramjet engine propels an aircraft at a Mach number of 1.4 and at an altitude of 6000 m. The diameter of the inlet diffuser at entry is 40 cm and the calorific valve of the fuel is 43MJ/kg. The stagnation temperature at the nozzle entry is 1500 K. The properties of the combustion gases are same as those of air. i) The efficiency of the ideal cycle.	10	5

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	ii) Flight speed iii) Air flow rate iv) Diffuser pressure ratio v) Fuel air ratio vi) Nozzle pressure ratio		

4. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Describe the important properties of solid propellants desired for rocket propulsion.	10	4
b.	Explain in the construction and working details about turbo fan engine.	10	5

5. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Explain in the construction and working details about Ramjetengine.	10	4
b.	Explain chocked flow through nozzle.	10	2

6. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	With neat sketch explain about Turbo propengine.	10	5
b.	An aircraft flies at 960kmph. One of its turbojet engines takes in 40kg/s of air and expands the gases to the ambient pressure. The air-fuel ratio is 50 and the lower calorific value of the fuel is 43MJ/kg. For maximum thrust power determine a) Jet velocity b)Thrust c) Specific thrust d)Thrust power e) Propulsive, thermal and overall efficiency	10	5

7. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	A rocket has the following data Propellant flow rate = 0.5 Kg/s Nozzle exit diameter = 10cm Nozzle exit pressure = 1.02bar Ambient pressure = 1.013 bar Thrust chamber pressure = 20 bar Thrust = 7 KN Determine: Effective jet velocity, actual jet velocity, specific impulse and specific propellant consumption. Recalculate the value of thrust and specific impulse for an altitude where ambient pressure is 10 mbar.	10	5
b.	Explain in detail about turbo jet engine.	10	4