Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3160102 Date:15-05-2024

Subject Name:Fundamentals of Jet Propulsion

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain the jet cycle in brief.	**03**
	(b)	Differentiate high bypass and low bypass turbofan engine.	**04**
	(c)	Draw and explain h-s diagram for turbofan engine.	**07**
Q.2	**(a)**	Prove that for maximum thrust weight ratio maximum propulsive efficiency obtained is 66.66%.	**03**
	(b)	Explain the role of water injection method.	**04**
	(c)	Write a note on Thrust augmentation and bleed burn techniques.	**07**
		OR	
	(c)	Explain Performance characteristics of turbojet engine with the change in cycle temperature ratio and compressor pressure ratio.	**07**
Q.3	**(a)**	Discuss critical, subcritical and supercritical operation of ramjet diffuser.	**03**
	(b)	Draw P-V and T-S diagram of Brayton cycle with reheating.	**04**
	(c)	Discuss effect of back pressure in convergent divergent nozzle.	**07**
		OR	
Q.3	**(a)**	Define bypass ratio and bypass fraction.	**03**
	(b)	Explain the subsonic inlets and supersonic inlets.	**04**
	(c)	Derive Mach area relation for flow through variable area ducts and explain it’s importance in view of jet engine nozzle section .	**07**
Q.4	**(a)**	Explain the annular and can type combustion chamber with their merits and demerits.	**03**
	(b)	Explain lean mixture, rich mixture and their effect on performance of complete combustion.	**04**
	(c)	Explain the concept of turbine blade cooling and methods to achieve the same.	**07**
		OR	
Q.4	**(a)**	Suggests the Materials used for combustion chamber.	**03**
	(b)	Derive the expression for nozzle exit velocity and nozzle coefficient for convergent ducts.	**04**
	(c)	What is choking? Prove that critical pressure ratio for convergent duct is 0.528.	**07**
Q.5	**(a)**	Define internal and external flow from a jet engine. Derive the expression of pressure thrust and jet thrust.	**03**
	(b)	Write a note on pulsejet engine.	**04**
	(c)	Discuss simple design calculation of ramjet engine.	**07**

OR

Q.5	**(a)**	Derive thrust equation for rocket engine.	**03**
	(b)	Derive expressions for thermal efficiency, propulsive efficiency, TSFC and Specific impulse for turbojet engine.	**04**
	(c)	Write a note on liquid propellant rocket engine.	**07**

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