Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160102 **Date: 03/01/2013**

Subject Name: Fundamentals of Jet Propulsion

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain solid rocket motor thrust chamber cooling	**07**
	(b)	Derive Euler's fundamental equation for turbo machines	**07**
Q.2	**(a)**	Explain and list differences between positive displacement machines and turbo machines	**07**
	(b)	Explain starting problems in supersonic inlets and how to overcome starting problem?	**07**
		OR	
	(b)	How diffuser performance in terms of pressure recovery and efficiency can be evaluated? Explain in detail	**07**
Q.3	**(a)**	Compare performance of turboprop, turbojet and turbofan engine in terms of velocity, altitude, efficiencies and thrust variation	**07**
	(b)	Derive thrust equation for turbofan engine	**07**
		OR	
Q.3	**(a)**	What are different thrust augmentation techniques which increase the mass flow rate and hence thrust during augmentation?	**07**
	(b)	What do you understand by air breathing and non-air breathing propulsion system? Explain each with one example and their working with neat sketches	**07**
Q.4	**(a)**	Define: 1. Equivalence ratio, 2. Combustion loading parameter, 3. Space heat release rate, 4. Reaction rate parameter, 5. Cooling effectiveness, 6. Pattern factor, 7. profile factor	**07**
	(b)	Explain optimum expansion, under expansion and over expansion nozzle with suitable diagram	**07**
		OR	
Q.4	**(a)**	Explain types and properties of materials used for gas turbine combustion chamber	**07**
	(b)	Why actual mass flow rate through nozzle is more than theoretical mass flow rate? Also explain different equilibrium conditions of nozzle.	**07**
Q.5	**(a)**	Explain Ramjet engine working with operating cycle with schematic diagram. Derive equation for efficiency and pressure ratio	**07**
	(b)	Give selection criteria of liquid propellant engine	**07**
		OR	
Q.5	**(a)**	Explain in detail any two thrust vectoring control techniques used in solid rocket motor.	**07**
	(b)	Derive equation for exhaust velocity from first principle	**07**

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