GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3130109   **Date:29-06-2024**
Subject Name: Thermodynamics for Aeronautical Engineering
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.**
5. **Use of steam table is permitted.**

Q.1	**(a)**	Write limitation of the first law of thermodynamics.	03
	(b)	Explain the followings:	04
		a. Microscopic and Macroscopic point of view	
		b. Intensive and extensive properties.	
	(c)	Derive the general energy equation and reduce it for steady flow energy equation. Apply the same for Nozzle.	07
Q.2	**(a)**	Give causes of irreversibility in detail.	03
	(b)	Derive an expression of efficiency of an Otto cycle.	04
	(c)	Draw and explain P-V and T-s diagram of a Dual cycle.	07
		OR	
	(c)	Draw and explain P-V and T-s diagram of a Carnot cycle.	07
Q.3	**(a)**	Define: open system and close system. Give examples of such systems.	03
	(b)	Prove that efficiency of a Brayton cycle is a function of cycle pressure ratio.	04
	(c)	Discuss perpetual motion machines of first kind and second kind.	07
		OR	
Q.3	**(a)**	State 2nd law of thermodynamics and give its applications in the field.	03
	(b)	Compare Kelvin-Plank and Clausius statement of second law of thermodynamics.	04
	(c)	Explain the steady flow energy equation for nozzle and boiler.	07
Q.4	**(a)**	What is the need of modifications of basic Brayton cycle.	03
	(b)	What is an exergy? Explain in short.	04
	(c)	Draw and explain Brayton cycle with regeneration.	07
		OR	
Q.4	**(a)**	Derive the relation, Cp-Cv = R.	03
	(b)	Derive the first and second T-dS equations.	04
	(c)	State the principle of increase of entropy. List the four application of entropy principle.	07
Q.5	**(a)**	Define coefficient of volume expansion and isothermal compressibility.	03
	(b)	Draw and explain Rankine cycle with superheat.	04
	(c)	Write down Jet engine components. Derive expression for component efficiency of exit Nozzle.	07
		OR	
Q.5	**(a)**	What is the need of jet engine inlet diffuser?	03
	(b)	Draw h-s diagram of diffuser and derive its efficiency equation.	04
	(c)	Derive Maxwell relations	07

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