Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3132504 Date:24-02-2023

Subject Name:Basic and Applied Thermodynamics

Time:02:30 PM TO 05:00 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)**	Differentiate macroscopic and microscopic point of view in thermodynamics.	**03**
	(b)	Explain Thermodynamic equilibrium with example	**04**
	(c)	Give detailed explanation on following topics : 1. Quasi-static process 2. Point function vs Path function	**07**
Q.2	**(a)**	Define 1) Internal energy 2) Enthalpy 3) Specific Heat	**03**
	(b)	Explain First law of thermodynamics for a process in a closed system.	**04**
	(c)	One kg mass of air expands reversibly from 6.5 bar and 0.0135 m^3 to a final volume of 0.1 m^3. Find the final pressure, final temperature, work done, change in internal energy and heat interaction, if the expansion is: (a) Adiabatic (b) Polytropic with n = 1.3 (c) Isothermal	**07**
		OR	
	(c)	Explain and derive equation for Steady flow through a Heat Exchanger.	**07**
Q.3	**(a)**	Write down limitations of first law of thermodynamics	**03**
	(b)	Explain Carnot theorem.	**04**
	(c)	Explain Equivalence of kelvin-plank and clausius statements.	**07**
		OR	
Q.3	**(a)**	Explain causes of irreversibility.	**03**
	(b)	Explain inequality of Clausius.	**04**
	(c)	Exhaust steam at 50kPa, 150 ^{0}C enters a subsonic diffuser with a velocity of 180 m/s. The area at the diffuser inlet is 1000 cm^2. During passage of steam through the diffuser, its velocity decreases to 90 m/s, and the pressure increases to 1 bar. Also 120kW of heat is lost to the surroundings from the diffuser surface. Determine the area at diffuser outlet.	**07**
Q.4	**(a)**	Explain briefly heat engine and heat pump.	**03**
	(b)	Give brief comparison of Otto, diesel and dual cycle.	**04**
	(c)	Determine expression for air standard efficiency of Otto cycle with neat sketch of P-V and T-S diagram.	**07**
		OR	
Q.4	**(a)**	Write short note on Bell-Coleman cycle.	**03**
	(b)	Differentiate Carnot and Rankine Cycle.	**04**
	(c)	(a) One kg of water at 300 K is heated to 500 K by bringing it in contact with a heat reservoir at 500 K. Determine the entropy change of the universe.	**07**

(b) If instead the water is first heated to 400 K by bringing it in contact with an intermediate heat reservoir at 400 K, and then to 500 K as before, what will be the entropy change of the universe in this case?
(c) State how water could be heated from 300 K to 500 K almost without any change in the entropy of the universe.

Q.5	**(a)**	Write principle of operation of steam turbine.	**03**
	(b)	Explain Simple Vapor Compression Refrigeration (VCR).	**04**
	(c)	Explain with neat sketch velocity compounding of impulse turbine.	**07**

OR

Q.5	**(a)**	Draw velocity diagram for reaction turbine.	**03**
	(b)	Define the term "Degree of Reaction". Explain Parson's reaction turbine	**04**
	(c)	List out methods for governing of steam turbine and explain any one with neat sketch in detail.	**07**

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