Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3130109 Date:15-07-2022

Subject Name:Thermodynamics for Aeronautical Engineering

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.**

Q.1	**(a)**	State and define different thermodynamic systems.	**03**
	(b)	Describe quasi-static process.	**04**
	(c)	A steam enters a nozzle at a pressure of 7 bar and 200 ºC and leaves at a pressure of 2 bar. The initial velocity of steam at the entrance is 50 m/s and exit velocity from nozzle is 750 m/s. the mass flow rate through the nozzle is 1500 kg/hr. the heat loss from the nozzle is 12000 KJ/hr. Determine final Enthalpy of steam and nozzle area if the specific volume is 1.25 m^3/kg. take initial enthalpy 2850 KJ/kg.	**07**
Q.2	**(a)**	Show that the COP of a heat pump is greater than the COP of Refrigerator by unity.	**03**
	(b)	Write kelvin plank and Clausius statement of second law of thermodynamics with examples.	**04**
	(c)	Prove that entropy is property of system.	**07**
		OR	
	(c)	Explain concept of exergy and its application.	**07**
Q.3	**(a)**	Define Steam rate, and Heat rate for Rankine cycle also write the equation for the same.	**03**
	(b)	Explain any two methods of improving efficiency of Rankine Cycle.	**04**
	(c)	Derive Maxwell's equation and state their importance in thermodynamics.	**07**
		OR	
Q.3	**(a)**	Sketch Rankine cycle on P-V, T-S and h-s diagram.	**03**
	(b)	Write comparison of Carnot and Rankine cycle	**04**
	(c)	Derive the first and second T ds equation and set up the expression for the difference in heat capacities C_p and C_v.	**07**
Q.4	**(a)**	State the application of heat exchanger in the field of engineering.	**03**
	(b)	Draw P-V and T-S diagram of Dual combustion cycle.	**04**
	(c)	Derive an equation for air standard efficiency of otto cycle.	**07**
		OR	
Q.4	**(a)**	The engine working on ideal otto cycle. The temperature at the beginning and at the end of compression is 60ºC and 450ºC.determine air standard efficiency and compression ratio.	**03**
	(b)	What is regeneration? How it improves the thermal efficiency of a simple open cycle gas turbine plant?	**04**
	(c)	Derive an air standard efficiency expression for Brayton cycle in terms of r_p and γ.	**07**
Q.5	**(a)**	Discuss perpetual motion machine of first kind.	**03**
	(b)	Calculate co-efficient of performance and heat transfer rate in condenser of a refrigerator which having refrigeration capacity 1 tons and power Required to compressor is 0.8KW	**04**

	(c)	Write down Jet engine components. Derive expression for component efficiency of any one component	**07**

OR

Q.5	**(a)**	Explain working principle of jet engine.	**03**
	(b)	Explain Reversible and Irreversible process with suitable examples.	**04**
	(c)	Write energy relations for various processes occurring in jet engine.	**07**

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