Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III EXAMINATION – SUMMER 2020

Subject Code: 3130109 Date:02/11/2020

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.**

			Marks
Q.1	**(a)**	What do you understand by Vapour power cycles?	**03**
	(b)	What do you mean by Critical Point? Discuss.	**04**
	(c)	Explain Carnot Cycle and different processes with schematic and Also represent it on a p-V and T-s diagrams.	**07**
Q.2	**(a)**	State and explain Gibbs-Dalton's law.	**03**
	(b)	How does regeneration affect the efficiency of a Brayton cycle, and how does it accomplish it?	**04**
	(c)	Derive the general energy equation and reduce it for steady flow energy equation. Apply the same for boiler.	**07**
		OR	
	(c)	A domestic food freezer maintains a temperature of -15^{0}C. The ambient air temperature is 30^{0}C. If heat leaks into the freezer at the continuous rate of 1.75 kJ/s what is the least power necessary to pump this heat our continuously?	**07**
Q.3	**(a)**	Derive MAXWELL's equations.	**03**
	(b)	State the difference between Air-breathing engine and Non-air breathing engine in jet propulsion.	**04**
	(c)	Express the overall efficiency of steam power plant as the product of boiler, turbine, generator and cycle efficiencies.	**07**
		OR	
Q.3	**(a)**	List different components use in jet propulsion engine in sequence.	**03**
	(b)	Explain the followings: 1. Microscopic and macroscopic point of view 3. Intensive and extensive properties	**04**
	(c)	With the help of p-v and T-s diagram, show that for the same maximum pressure and temperature of the cycle and the same heat rejection, $\eta_{Diesel} > \eta_{Dual} > \eta_{Otto}$.	**07**
Q.4	**(a)**	State the principle of increase of entropy. List the four application of entropy principle.	**03**
	(b)	What is the principal of jet propulsion?	**04**
	(c)	Derive the expression for efficiency and mean effective pressure for diesel cycle.	**07**
		OR	
Q.4	**(a)**	Compare Kelvin-Plank and Clausius statement of second law of thermodynamics.	**03**

	(b)	Define a thermodynamic system. Differentiate between open system, closed system and an isolated system.	**04**
	(c)	With neat sketch explains Otto Cycle in detail also derive expression for efficiency.	**07**
Q.5	**(a)**	Prove that $C_P - C_V = R$.	**03**
	(b)	An engine working on the Otto cycle is supplied with air at 0.1 Mpa, 35^0C.The compression ratio is 8.Heat supplied is 2100 kJ/kg. Calculate the cycle efficiency.	**04**
	(c)	With neat sketch explain Brayton Cycle in detail.	**07**

OR

Q.5	**(a)**	Write limitation of the first law of thermodynamics.	**03**
	(b)	With neat sketch show comparison Carnot and Rankine cycle.	**04**
	(c)	A Carnot engine absorbs 200 J of heat from a reservoir at the temperature of the normal boiling point of water and rejects heat to reservoir at the temperature of the triple point of water. Find the heat rejected, the work done by the engine and the thermal efficiency.	**07**

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