Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2020

Subject Code:3132504 Date:04/03/2021

Subject Name:Basic and Applied Thermodynamics

Time:10:30 AM TO 12:30 PM Total Marks:56

Instructions:

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

			Marks
Q.1	**(a)**	Explain thermodynamic system ,type of system	**03**
	(b)	Derive steady flow energy equation.	**04**
	(c)	Explain briefly Carnot theorem and corollary Carnot theorem.	**07**
Q.2	**(a)**	Explain point function and path function.	**03**
	(b)	Give the limitations of first law of thermodynamics.	**04**
	(c)	Derive thermal efficiency equation and mean effective pressure equation for diesel cycle.	**07**
Q.3	**(a)**	Explain causes of irreversibility.	**03**
	(b)	Explain principle of increase of entropy.	**04**
	(c)	A system having a mass of 40 kg, an initial velocity of 8 m/s, and its final velocity increase to 25 m/s. Its elevation also rises by 50 m. The system receives 20 kJ heat and 8 kJ work. If system delivers 0.003 kWh of electrical energy, calculate the change in the internal energy of the system.	**07**
Q.4	**(a)**	State the limitations of Carnot cycle.	**03**
	(b)	Give brief comparison of Otto, diesel and dual cycle.	**04**
	(c)	Two Carnot engines work in series between the sources and sink temperature of 1200 K and 300 K. If both engines having same efficiency, determine the intermediate temperature.	**07**
Q.5	**(a)**	Explain inequality of clausius theorem.	**03**
	(b)	Explain briefly Regenerative and feed heating.	**04**
	(c)	A Carnot cycle has lowest pressure and temperature equal to 1 bar and 20˚C. Pressure after isothermal compression is 4 bar. Pressure after isentropic compression is 12 bar and after isothermal heat addition process is 6 bar. Calculate (i) The highest temp. in the cycle. (ii) The change in entropy during isothermal expansion. (iii) Heat added to the cycle, (iv) Heat reflected by the cycle.	**07**
Q.6	**(a)**	Explain briefly heat engine and heat pump.	**03**
	(b)	Explain vapour compression system equipment nomenclature.	**04**
	(c)	A steam plant using Rankine cycle generated superheated steam at 10 bar and 380˚ C. Condensation occurs at 0.06 bar. Find out Rankine efficiency. What will be Carnot efficiency? Neglect feed pump work.	**07**
Q.7	**(a)**	Explain three types of turbine seals?	**03**
	(b)	Enlist assumptions in theoretical vapour compression cycle.	**04**
	(c)	What do you mean by governing of steam turbine? State various methods of governing and explain with neat sketch the Nozzle Control Governing.	**07**

Q.8 **(a)** Explain briefly thermodynamic temperature scale. **03**

(b) Define the term "Degree of Reaction". Explain Parson's reaction turbine **04**

(c) 300 kJ/s of heat is supplied at a constant fixed temperature of 290˚C to a heat engine. The heat rejection takes place at 8.5˚ C. The following results were obtained: (I) 215 kJ/s are rejected. (II) 150 kJ/s are rejected. (III) 75 kJ/s are rejected. Classify which of the result report at reversible cycle or irreversible cycle or impossible results. **07**

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