Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– III EXAMINATION – SUMMER 2026

Subject Code:3132504 Date:19-06-2026

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)**	What is the difference between system and surrounding?	**03**
	(b)	Distinguish between state and path function. Give examples of state and path function.	**04**
	(c)	What is nozzle and Diffuser? Apply steady flow energy equation to a convergent-divergent nozzle.	**07**
Q.2	**(a)**	What are the limitations of first law of thermodynamics?	**03**
	(b)	Give Kelvin-Plank statement and Clausius statement for second law of thermodynamics.	**04**
	(c)	In a steam power plant of 1 kg of water per second is supplied to the boiler. The enthalpy and velocity of water entering the boiler are 800 KJ/Kg and 5 m/s. The water receives 2200 KJ/Kg in the boiler at constant pressure. The steam after passing through the turbine comes out with the velocity of 50 m/s, and its enthalpy is 2520KJ/Kg. The inlet is 4 meter above the turbine exit. Assuming the heat loss from the boiler and turbine from surroundings are 20 KJ/Sec. Calculate the power developed by the turbine. Consider the boiler and the turbine as a single system.	**07**
		OR	
	(c)	Give characteristics of entropy. Derive the expression for clausius inequality.	**07**
Q.3	**(a)**	Explain the concept of mean effective pressure.	**03**
	(b)	Differentiate between air standard efficiency, brake thermal efficiency and relative efficiency.	**04**
	(c)	With schematics explain Carnot Vapor cycle. Also draw P-V diagram of the cycle.	**07**
		OR	
Q.3	**(a)**	Explain clearance volume and swept volume.	**03**
	(b)	For the same maximum pressure and temperature prove that thermal efficiency of diesel cycle is greater than dual cycle and Otto cycle.	**04**
	(c)	With P-V diagram explain Otto Cycle. Deduce an expression for the air standard efficiency of Otto Cycle.	**07**
Q.4	**(a)**	Give any THREE application of refrigeration.	**03**
	(b)	Explain components (i) compressor (ii) evaporator (iii) throttle valve and (iv) condenser with respect to simple vapor compression refrigeration cycle.	**04**

	(c)	A dense air refrigerator works on a bell Coleman cycle works between 3 bar and 15 bar pressure. The temperature of the air after evaporator is 5ºC and 20ºC respectively. The evaporator extracts 2000KJ/min of heat from the space to be cooled. Calculate (i) Amount of air required in the cycle per minute (ii) power required to run the system (iii) COP	**07**

OR

Q.4	**(a)**	Explain principle of operation of steam turbine.	**03**
	(b)	Give brief classification of steam turbine.	**04**
	(c)	What is compounding of steam turbine? Explain pressure compounding of steam turbine.	**07**
Q.5	**(a)**	What is PMM1 and PMM2?	**03**
	(b)	Explain the causes of irreversibility.	**04**
	(c)	Explain briefly brayton cycle. Derive expression for optimum pressure ratio.	**07**

OR

Q.5	**(a)**	Discuss the effect of suction pressure on performance of vapour compression refrigeration system.	**03**
	(b)	Define internal energy and prove that it is a property of a system.	**04**
	(c)	Explain (i) velocity diagram (ii) degree of reaction (iii) reheat factor with respect to reaction turbine.	07

****