

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: 3130109

Date: 15-12-2025

Subject Name: Thermodynamics for Aeronautical Engineering

Time: 10:30 AM TO 01:00 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) Define system, surroundings, and boundary with examples.	03
(b) Derive Steady Flow Energy Equation (SFEE) for open system.	04
(c) Draw and explain P-V and T-s diagram of a Dual cycle.	07
Q.2 (a) State Zeroth law of thermodynamics and its significance.	03
(b) Explain the concept of Entropy and its importance.	04
(c) Derive work ratio and steam rate of Rankine cycle.	07
OR	
(c) Explain in brief any two factors affecting Rankine cycle efficiency.	07
Q.3 (a) Define COP and write relation between COP of refrigerator and heat pump.	03
(b) Define heat engine and heat pump with schematic.	04
(c) Explain Brayton cycle (open type) with diagram and derive the expression of its efficiency.	07
OR	
(a) Write the assumptions of a Carnot cycle.	03
(b) Explain quasi-static process with example and P–V diagram.	04
(c) Derive the expression for efficiency of Carnot cycle.	07
Q.4 (a) Define availability, Unavailability and irreversibility.	03
(b) Explain the followings:	04
a. Microscopic and Macroscopic point of view	
b. Intensive and extensive properties.	
(c) Explain Clausius–Clapeyron equation and its importance.	07
OR	
(a) State Kelvin–Planck and Clausius statements.	03
(b) Explain application of first law to turbine.	04

- (c) Draw and explain Brayton cycle with regeneration. 07
- Q.5** (a) List the main components of a jet engine. 03
- (b) Compare Otto, Diesel, and Dual cycles based on same compressor ratio. 04
- (c) Explain working of nozzle in jet engine. Also derive the expression of nozzle exit velocity and nozzle efficiency. 07

OR

- (a) State the first law of thermodynamics and write limitations of the first law. 03
- (b) Compression ratio $r=8$. Working fluid = air, $\gamma=1.4$. Find the ideal Otto-cycle thermal efficiency η . 04
- (c) Derive Maxwell's equations. 07
