

Enrollment No./Seat No.:

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

Subject Code: 3130109

Date: 31-05-2025

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.**
- Use of Steam table is permitted.**

	Marks
Q.1 (a) What is meant by thermodynamics system? How do you classify it?	03
(b) Prove that the difference in specific heat capacities equal to $C_p - C_v = R$.	04
(c) Derive the steady flow energy equation and apply it to turbine.	07
Q.2 (a) Define intensive and extensive properties.	03
(b) What is meant by point and path function? Give the examples.	04
(c) What is the limitations of First law of thermodynamics? Write the two statements of second law of Thermodynamics	07
OR	
(c) Which are the components of the Carnot cycle? Why carnot cycle cannot be realized in practical for vapour power?	07
Q.3 (a) What is PMM2 and why is it impossible?	03
(b) Derive the expression for thermal efficiency of a Carnot cycle with its p-V and Ts Diagram?	04
(c) Write a short note on Air standard Otto Cycle.	07
OR	
(a) How diesel cycle and dual cycle differs than that of Otto cycle.	03
(b) Give comparison between otto cycle, diesel cycle and dual cycle for the same compression ratio and heat addition.	04
(c) Derive the expression of efficiency of the diesel cycle.	07
Q.4 (a) What is Clausius inequality?	03
(b) Draw and explain Brayton cycle in detail.	04
(c) In an Otto cycle air at 1bar and 290K is compressed isentropic ally until the pressure is 15bar The heat is added at constant volume until the pressure rises to 40bar. Calculate the air standard efficiency and mean effective pressure for the cycle. Take $C_v = 0.717 \text{ KJ/Kg K}$ and $R_{univ} = 8.314 \text{ KJ/Kg K}$.	07

OR

- (a)** Derive the expression of CoP of the refrigerator. **03**
- (b)** With a neat sketch explain the Rankine power cycle. **04**
- (c)** Dry saturated steam at 17.5 bar enters the turbine of a steam power plant and expands to the condenser pressure of 0.75 bar. Determine the Rankine cycle efficiency and the work ratio of the cycle. **07**

- Q.5**
- (a)** Derive the any one Tds equation based on Maxwell's equations. **03**
 - (b)** Derive the Maxwell's Equations. **04**
 - (c)** Explain the Brayton cycle with heat exchanger. **07**

OR

- (a)** Explain the thermodynamic processes involved in the various components of a jet engine. **03**
- (b)** Define the terms: Energy, entropy, availability and exergy. **04**
- (c)** with a neat T-S diagram, explain the Brayton cycle with reheating. **07**
