Sub Code: R2321031 **R23** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURAJADA VIZINAGARAM
II B. Tech I Semester Regular/Supply Examinations, November – 2025
THERMODYNAMICS
(ME)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part A, Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.
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PART-A **(20 Marks)**

1	a)	Define a system in thermodynamics.	[2]
	b)	Differentiate between the system and surroundings.	[2]
	c)	Define work and heat in thermodynamics.	[2]
	d)	State the First Law of Thermodynamics.	[2]
	e)	State the Kelvin–Planck statement of the Second Law of Thermodynamics.	[2]
	f)	State Clausius' inequality.	[2]
	g)	What is the significance of the *triple point* in phase diagrams?	[2]
	h)	What are *property tables* and why are they important in thermodynamics?	[2]
	i)	Define Coefficient of Performance (COP) in refrigeration systems.	[2]
	j)	What is the difference between sensible heat and latent heat?	[2]

PART-B **(50 Marks)**

Unit-1

2	a)	Describe the difference between macroscopic and microscopic viewpoints in thermodynamics.	[5]
	b)	Describe different types of boundaries and their significance in thermodynamic systems.	[5]
		(OR)	
3	a)	Explain the quasi-static process and its significance in thermodynamics	[5]
	b)	Differentiate between reversible and irreversible processes with examples.	[5]

Unit-2

4	a)	Describe the Joule's experiment and its significance	[5]
	b)	Describe the PMM-I and why it is impossible.	[5]
		(OR)	
5	a)	Explain the working principle of a heat engine.	[5]
	b)	Discuss the role of enthalpy in the study of thermodynamic processes.	[5]

Unit-3

6	a)	Explain why PMM-II is impossible, using the Second Law.	[5]
	b)	A Carnot refrigerator removes 200 kJ of heat from a low-temperature reservoir at 250 K and rejects it to a reservoir at 300 K. Calculate: COP and Work input	[5]
		(OR)	
7	a)	A heat engine operates between 800 K and 300 K. Calculate: Maximum possible efficiency (Carnot). If it produces 300 kJ of work, calculate heat absorbed.	[5]

	b)	State and explain the Clausius inequality.	[5]

Unit-4

8	a)	Differentiate between wet steam, dry saturated steam, and superheated steam using P-V and T-S diagrams. Provide numerical examples.	[5]
	b)	Determine the dryness fraction of steam using data from a throttling calorimeter.	[5]

(OR)

9	a)	Calculate the volume change and heat transfer for a process where 2 kg of saturated water at 1 atm is heated to superheated steam at 300°C.	[5]
	b)	A throttling calorimeter test gives a final temperature of 100°C after steam is throttled from 1 MPa. Determine the dryness fraction of the steam.	[5]

Unit-5

10	a)	Define psychrometric properties (dry bulb temperature, wet bulb temperature, specific humidity, relative humidity). Use a psychrometric chart to find them for a given state.	[5]
	b)	A space is maintained at 24°C and 50% RH. Determine the dew point temperature, specific humidity, and enthalpy using a psychrometric chart.	[5]

(OR)

11	a)	Compare refrigeration cycles using R-22 and R-134a using enthalpy data and compute performance parameters.	[5]
	b)	Explain SHF (Sensible Heat Factor). A room has sensible heat load = 10 kW and latent heat load = 5 kW. Find SHF and represent it on a psychrometric chart.	[5]

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