



	InSem Examination-II Summer 2024		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: IV	
	Name of Programme : SY B.Tech	Pattern: 2022	
	Name of Course: Engineering Thermodynamics	Course Code: MEC222011	
	Max. Marks: 30	Duration: 1 hour	

	<p>Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none">1. This question paper contains __02__ page(s).2. Answer to each new question is to be started on a new page.3. Assume suitable data wherever required, but justify it.4. Draw the neat labelled diagrams, wherever necessary.5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.	
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Question No. 1 Attempt following Question

- a) Explain both the statements of second law of thermodynamics. Draw block diagrams of two devices which violate these statements (5) CO1

OR

- b) Draw block diagram of heat engine, refrigerator and heat pump and write expression used for finding their performance (5) CO1
- c) Rate of Heat absorbed by Evaporator is to be determined when the refrigerant flow rate is 0.1 kg/s. The enthalpy at the inlet is 100 kJ and the exit enthalpy is 150 kJ. State clearly the assumptions made in this analysis. (5) CO1

OR

- d) Calculate the minimum power consumed by a heat pump operating between reservoirs at temperatures -3 degree celsius and 27 degree celsius while heating the room at the rate of 2 kW (5) CO1
- e) Calculate the minimum work input to a refrigerator whose refrigerating effect is 50 Watts. The system works between 250 K and 320 K (5) CO1

OR

- f) A household refrigerator is in kitchen and removes 300 kJ/min of heat from the refrigerator. The COP of the refrigerator is 3. Find the power consumed by the refrigerator and heat rejected to the kitchen (5) CO1

Question No. 2 Attempt following Question

- a) Represent Carnot Engine cycle on Temperature entropy and pressure volume diagram and name all the four processes that constitute the cycle. During which processes entropy increases and why? (5) CO2

OR

- b) Explain the concepts of internally reversibility and external reversibility with examples. (5) CO2
- c) Prove that entropy is a property of system applying Clausius theorem (5) CO2

OR

- d) How can entropy change for closed system. Discuss entropy change during reversible adiabatic expansion and reversible expansion with heat exchange . (5) CO2
- e) 50 kg of hot copper block at 100 degree Celsius is dropped in river which is at 30 degree Celsius. (5) CO2
What will happen to the entropy of copper block and river? What will happen to the entropy of universe during this process? Calculate the entropy change of copper block. Assume specific heat of copper as 0.38 kJ/kg K

OR

- f) What happens to available energy when heat is transferred through finite temperature difference? (5) CO2
Derive an expression for increase in unavailable energy when heat is transferred through finite temperature difference.

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