BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BTech **SEMESTER : III**
BRANCH: Chemical Engineering/FT **SESSION : MO/2025**

SUBJECT: CL24201 THERMODYNAMICS

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	A new engine is claimed to have a power output of 4.5 hp while receiving a heat input of 6.25 kW and working between the source and sink temperature limits of 1000 K and 500 K. Determine the efficiency of the proposed engine. Is the claim for the engine admissible? [1 hp = 745.7 W]	[2]	1	4
Q.1(b)	Define and give examples to the following terms: (i) Isochoric process (ii) Reversible process (iii) System	[3]	1	2
Q.2	Explain the work required in the case of Isothermal and Adiabatic process.	[5]	1	2
Q.3	What is chemical potential? Write down the Maxwell's equations. Show that $C_P - C_V = R$ for an ideal gas	[5]	2	2
Q.4(a)	Calculate the change in entropy when one gram of ice at 273 K is converted into steam at 373K. Latent heat of fusion of ice = 336 J/g, latent heat of vaporisation = 2268 J/g and the mean specific heat of water between 273 K and 373 K = 4.2 J/g K	[2]	1	4
Q.4(b)	With a suitable graph, find out the efficiency of Carnot engine.	[3]	1	2
Q.5(a)	The volume of a mixture of two organic liquids 1 and 2 is given by $V = 110.0 - 17x_1 - 2.5x_1^2$ where V is the volume in m^3/mol at 1.0 bar and 300 K. Find the expressions for molar volume of each component.	[2]	4	4
Q.5(b)	How can you determine fugacity of a component in gaseous solutions?	[3]	4	1

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