BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER : IV/ADD**
BRANCH: MECH **SESSION : SP/2025**

SUBJECT: ME209 ENERGY CONVERSION SYSTEMS

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**
Steam Tables

			CO	BL
Q.1(a)	Describe the main components of a steam power plant and their functions.	[2]	1	LOW
Q.1(b)	Explain different processes of Rankine cycle using the P-v, T-s, and h-s diagrams.	[3]	1	LOW
Q.2	Steam enters the turbine of a power plant at 5 MPa and 400°C, and exhausts to the condenser at 10 kPa. The turbine produces a power output of 20 000 kW with an isentropic efficiency of 85%. What is the mass flow rate of steam around the cycle and the rate of heat rejection in the condenser? Find the thermal efficiency of the power plant and compare it with a Carnot cycle efficiency.	[5]	1	MED
Q.3	Consider an ideal steam reheat cycle where steam enters the high-pressure turbine at 3.0 MPa, 400°C, and then expands to 0.8 MPa. It is then reheated to 400°C and expands to 10 kPa in the low-pressure turbine. Calculate the cycle thermal efficiency and the moisture content of the steam leaving the low-pressure turbine.	[5]	1	MED
Q.4	The percentage analysis of gaseous fuel by volume is given as follows: CO_2 = 8%, CO = 22%, O_2 = 4%, H_2 = 30% and N_2 = 36% Determine i) the minimum air required for complete combustion of 1 m^3 of the gas, ii) calculate the percentage composition by volume products of combustion and iii) if 1.4 m^3 of air supplied per m^3 of gas, what will be percentage of by volume of CO_2 in the combustion products?	[5]	2	MED
Q.5(a)	What do you mean by boiler draught? Explain the difference between natural draught and artificial draught.	[2]	2	LOW
Q.5(b)	Derive an expression for natural draught of a boiler due to the height of the chimney.	[3]	2	MED

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