

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION SP2023)

CLASS: BTECH  
BRANCH: MECHANICAL

SEMESTER : IV  
SESSION : SP2023

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

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Q.1(a)	Explain the Regeneration and Reheating as modification in basic Rankine cycle.	[2]	1 2
Q.1(b)	Write the comparison of Carnot cycle and Rankine cycle based on Steam Rate and thermal efficiency with diagrams.	[3]	1 2
Q.2	Following data refers to steam power plant: inlet condition of steam in the turbine unit is 1.5MPa and 550°C; reheating done at 4 MPa to 550°C; and condensing done at 0.01 MPa. Considering ideal processes evaluate the cycle efficiency and the steam rate.	[5]	1 5
Q.3	Fuel supplied to boiler, by mass, has the composition: C=80%; H <sub>2</sub> = 5%; O <sub>2</sub> =6%; remaining incombustible matter. The composition of Dry flue gasses, by volume, is : CO <sub>2</sub> =10%; CO=1.5%; O <sub>2</sub> =8.5%; and N <sub>2</sub> =80% Use the following data: Atmospheric temperature = 20°C, Flue gas temperature = 400°C, Calorific of C to CO <sub>2</sub> = 33900 kJ/kg ; and Calorific of C to CO = 10045 kJ/kg. Estimate: (i) Excess air supplied per kg of fuel; (ii) Heat loss by incomplete combustion.	[5]	2 5
Q.4	In a boiler plant, coal fired is 400kg/hr and 3200 kg of water at 44.5°C evaporates into superheated condition at pressure of 1.2MPa and 274.5°C. The calorific value of coal is 32760kJ/kg. Estimate Equivalent evaporation “from and at 100°C”, and thermal efficiency of the boiler. Take specific heat of superheated steam = 2.1kJ/kgK.	[5]	2 5
Q.5(a)	Distinguish between forced draught and induced draught.	[2]	2 2
Q.5(b)	Derive the condition of maximum discharge through the chimney.	[3]	2 3

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