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

CLASS: BTECH **SEMESTER: III**
BRANCH: MECHANICAL **SESSION: MO/2022**

SUBJECT: ME201 THERMODYNAMICS

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. **The total marks of the questions are 25.**
2. **Candidates attempt for all 25 marks.**
3. **Before attempting the question paper, be sure that you have got the correct question paper.**
4. **The missing data, if any, may be assumed suitably.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

				CO	BL
Q1	(a)	Outline the importance of quasi-static process from thermodynamics point view.	[2]	CO1	Low
Q1	(b)	A tank has two rooms separated by a membrane. Room A contains 2 kg of air with a specific volume 0.5 m^3/kg, while tank B has 0.75 m^3 of air with a density of 0.8 kg/m^3. The membrane is now broken and the two masses of air come to a uniform state. Find the final specific volume of air.	[3]	CO1	Low
Q2	(a)	How will you distinguish between point function and path function? Explain with suitable example.	[2]	CO1	Low
Q2	(b)	Dry steam at 10 bar is cooled at constant volume to 3 bar. Determine the dryness fraction after cooling.	[3]	CO1	Med
Q3	(a)	Under what condition the work done equal to $\int_1^2 pdV$?	[2]	CO1	Low
Q3	(b)	A gas is compressed from V_1 = 0.09 m^3 to V_2 = 0.03 m^3. The relation between pressure and volume during the process is p = 14V + 2.44, where p and V are bar and m^3 respectively. Find the work done in kJ.	[3]	CO1	Med
Q4	(a)	Show that internal energy is a property of the system.	[2]	CO2	Low
Q4	(b)	Two insulated tank A and B are connected by a valve. Tank A has a volume of 0.6 m^3 and contains air at 200 kPa, 200 ^oC. Tank B has a volume of 0.3 m^3 and contains air at 500 kPa, 130 ^oC. The valve is opened fully and two tanks come to a uniform state. Determine the final pressure.	[3]	CO2	Med
Q5		Steam at 4 MPa, 400 ^oC enters a turbine with a velocity of 15 m/s. As it expands in the turbine, the heat loss through the turbine casing becomes 60 kW. The steam leaves the turbine at 0.1 bar, 0.91 dryness with a velocity of 65 m/s. The difference in elevations of the inlet and outlet pipes 2 m (inlet pipe at higher level). Determine the power developed by turbine for a steam flow rate of 50000 kg/hr.	[5]	CO2	Med

:::::: 30/09/2022 ::::::M