BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: BTECH **SEMESTER : III**
BRANCH: MECHANICAL **SESSION : MO/2023**

SUBJECT: ME201 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*. STEAM TABLE will be supplied to the candidates or will be allowed to use by the candidates**

			CO	BL
Q.1(a)	Explain work from thermodynamics point of view.	[2]	1	3
Q.1(b)	Explain the following: (i) Intensive and extensive properties (ii) free expansion process	[3]	1	3
Q.2	A 1m^3 rigid tank has air at 15 bar and ambient temperature 27°C connected by a valve to a piston cylinder. The piston of area 0.1 m^2 requires 2.5 bar below it to float. The valve is opened and the piston moves slowly 2m up and the valve is closed. During the process air temperature remains at 27°C. Evaluate the final pressure in the tank?	[5]	1	5
Q.3(a)	Determine the temperature of water at a state of P = 0.5MPa and h = 2890kJ/kg	[2]	1	5
Q.3(b)	Determine the amount of heat to be supplied to 2kg of water at 25°C to convert it to steam at 5 bar and 0.9 dry.	[3]	1	5
Q.4(a)	Explain First Law of thermodynamics for the cycle and the non-cyclic process.	[2]	2	3
Q.4(b)	For a polytropic process $pv^{\gamma} = constant$ Prove that $$\int_1^2 \delta Q = \left(\frac{\gamma - n}{\gamma - 1}\right) \times polytropic\ work\ done$$	[3]	2	
Q.5	The fluid parameters at the inlet of a steam nozzle are: Enthalpy=2850kJ/kg; velocity=50m/s; area=0.1m^2; and specific volume=0.18m^3/kg. At the discharge end the enthalpy is 2650kJ/kg and the specific volume is 0.49m^3/kg. At the exit of the nozzle evaluate (i) velocity of steam, (ii) mass flow rate of fluid, and (iii) the exit area of the nozzle. Assume nozzle is horizontal and there is negligible heat loss from it.	[5]	2	5

:::::26/09/2023 E:::::