Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 11.45am to 01.15pm

School: SOE	**Program:** Mechanical Engineering	
Course Code: MEC2517	**Course Name:** Basic Thermodynamics	
Semester: III	**Max Marks**: 50	**Weightage**:25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**28**	**22**			

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	compare between closed system and open system	**2 Marks**	**L3**	**CO1**
2	Define thermal equilibrium.	**2 Marks**	**L1**	**CO1**
3	State First law of Thermodynamics for cyclic process	**2 Marks**	**L1**	**CO2**
4	A chemical reaction takes place inside a sealed and insulated container. Analyze whether this system is truly isolated and identify any factors that could cause a loss of isolation	**2 Marks**	**L1**	**CO1**
5	Consider a pressure cooker on a stove with safety valve in closed position. Identify the type of system with reason	**2 Marks**	**L1**	**CO1**

Part B

Answer the Questions. **Total Marks 40M**

6.	Prove that Internal Energy is path function (Property)	**10 Marks**	**L4**	**CO2**
	Or			
7.	Derive an expression for first law of Thermodynamics for open system Steady Flow Energy Equation	**10 Marks**	**L4**	**CO2**
8.	A gas initially at 100 kPa and 6000 cm^3. The final volume is 2000 cm^3. Determine the moving boundary work for each of the following processes: (i) p is proportional to V, (ii) p is inversely proportional to V and	**10 Marks**	**L3**	**CO1**
	Or			
9.	A non-flow system executes four different thermodynamic process in sequence continuously as followed 1-2 Adiabatic compression 2-3 Iso baric heat addition 3-4 Adiabatic expansion 4-1 Constant Volume Heat rejection The temperature at four salient points 1,2,3,4 are seperately300K , 700K, 1500K and 600K. The working substance is 1 kg mass of air for which $C_p = 1.005\,kJ/kgK$, $C_V = 0.718\,kJ/kgK$ Determine i) Heat Transfer, ii) Change in internal Energy iv) Network and heat tranter for the cycle and internal energy for the cycle	**10 Marks**	**L3**	**CO1**
10.	In 1709, Sir Issac Newton proposed a new temperature scale. On this scale, the temperature was a linear function on Celsius scale. The reading on this at ice point (0˚C) and normal human body temperature (36˚C) were 0˚N and l2˚N, respectively. Obtain the relation between the Newton scale and the Celsius scale	**10 Marks**	**L3**	**CO1**
	Or			
11.	The e.m.f. in a thermocouple with the test junction at t°C on the gas thermometric scale and reference junction at ice point is given by $\varepsilon = 0.20\,t - 5 \times 10^{-4}\,t^2$ mV. The mili-volt meter is calibrated at the ice and steam points. What will be the thermocouple read in a place where the gas thermometer reads 50°C?	**10 Marks**	**L3**	**CO1**

12.	A steam turbine develops 550 kW of power with a steam flow rate of 5000 kg/h. If the heat loss from the casing and bearings are negligible, find (a) change in enthalpy across the turbine for a negligible inlet velocity and 360 m/s of exit velocity. Also change in potential energy are negligible.	**10 Marks**	**L3**	**CO2**
	Or			
13.	Air enters a convergent nozzle with velocity of 40m/s. The enthalpy decreases by 180kJ/kg. Determine the exit velocity. Assume adiabatic conditions in the nozzle output in kJ/kg. Take internal energy as a function of temperature only and Cv = 0.7 kJ/kgK	**10 Marks**	**L3**	**CO2**