Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 09 – 12- 2025 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** Mechanical Engineering	
Course Code : MEC2517	**Course Name:** Basic Thermodynamics	
Semester: III	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**16**	**26**	**18**	**20**	**10**	**10**

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. **10Q x 2M=20M**

1.	Define and explain thermodynamic system with sketch	**2 Marks**	**L1**	**CO1**
2.	Differentiate between extensive and intensive property	**2 Marks**	**L2**	**CO2**
3.	Define and explain reversible process	**2 Marks**	**L2**	**CO1**
4.	Define work in thermodynamics point of view with example	**2 Marks**	**L1**	**CO1**
5.	Differentiate between heat Engine and reverse heat Engine	**2 Marks**	**L2**	**CO3**
6.	Define and explain significance of Coefficient for Performance for refrigerator	**2 Marks**	**L2**	**CO3**
7.	List the processes in Carnot Cycle	**2 Marks**	**L1**	**CO3**
8.	Define pure substance with example	**2 Marks**	**L1**	**CO2**
9.	Differentiate between wet steam and superheated steam	**2 Marks**	**L2**	**CO2**
10.	Differentiate between Ideal and real gas	**2 Marks**	**L2**	**CO3**

Part B

Answer the Questions. **Total Marks 80M**

11.	System comprising of a certain mass of a gas is heated at constant volume. The heat transfer is 200 kJ. The gas is then cooled at constant pressure during which heat transferred out is 70 kJ and the work done on it is 50 kJ. If the system is then restored to its initial state through an adiabatic process, find the magnitude and direction of the work during the adiabatic process. Sketch on PV diagram	**10 Marks**	**L3**	**CO3**
	Or			
12.	A rotary compressor takes in air at 1 bar and a specific volume of 0.08 cu.m/kg. The discharge pressure and specific volume are 7 bar and 0.016 cu.m/kg. The entry and exit internal energies are 48 and 200 kJ/kg respectively. The heat loss from the turbine casing is 120 kJ/kg of air. Calculate the work input to the compressor neglecting the changes in kinetic and potential energies.	**10 Marks**	**L3**	**CO3**

13.	A constant volume gas thermometer containing helium gas gives readings of gas pressure of 1000 and 1366 mm of mercury at the ice point and steam point respectively. (a) Express the gas thermometer Celsius temperature in terms of the gas pressure. (b) If the thermometer, when left standing in atmosphere registers 1075 mm of mercury, determine the atmospheric temperature	**10 Marks**	**L3**	**CO1**
	Or			
14.	A fluid flowing in a sequence as given to complete a cycle. (i) It is heated reversibly at constant pressure of 1.05 bar until the volume becomes 0.02 m3. (ii) It is then compressed reversibly according to pV = constant to a pressure of 4.2 bar. (iii) It is then allowed to expand reversibly according to pV1.3 = constant. (iv) Finally it is heated at constant volume back to initial conditions. If the work done in the constant pressure process is 515 Nm, calculate the net work done by or on the cycle. Sketch the cycle on p-V diagram	**10 Marks**	**L3**	**CO1**

15.	Prove that both Kelvin Planc and Clausius statement are equivalent	**10 Marks**	**L2**	**CO4**
	Or			
16.	Prove that No engine is more efficient than reversible engine	**10 Marks**	**L**	**CO4**

17.	A heat engine A operates between a reservoir at 1000 K and a body at 600 K. Heat transfer to the heat engine is 1000 kJ and work output from the engine is 220 kJ. Another heat engine B operates between the body at 600 K and the atmosphere at 300 K. Heat rejected to the	**10 Marks**	**L3**	**CO4**

	atmosphere is 400 kJ. The body at 600 K maintains its temperature steady and has interactions only with the two engines A & B. Calculate the work output and the thermal efficiency of engine B			
	Or			
18.	In a reversed heat engine, the work done on the engine is 75 kJ and the heat transferred to the engine is 220 kJ. Evaluate the heat transfer from the engine and the COP of the engine (a) as a refrigerator and (b) as a heat pump	**10 Marks**	**L3**	**CO4**

19.	**a.**	With the help of Temperature Entlphy (T-h) diagram, explain the formation of superheated steam from ice at constant atmospheric pressure and differentiate regions of wet, dry and superheated steam	**10 Marks**	**L2**	**CO2**
	b.	Three types of steam with m=2kg, p=10.3bar Case 1: wet steam x=0.85 Case 2: dry saturated steam and Find, Enthalpy and entropy of steam	**10 Marks**	**L3**	**CO2**
		Or			
20.	**a.**	Explain Generalized compressibility chart for real gas with sketch	**10 Marks**	**L2**	**CO2**
	b.	The usual cooking gas cylinder (mostly methane) cylinder is about 25 cm in diameter and 80 cm height. It is charged at 12 MPa at room temperature of 27^{o}C. (a) assuming ideal gas law, find the mass of the gas filled in the cylinder, (b) If the cylinder is to be protected against excessive pressure by means of a fusible plug, at what temperature the plug has to melt to limit the pressure to 15 MPa? Assume molecular weight of methane to be 16.043 kg / kg mole	**10 Marks**	**L3**	**CO2**

21.	**a.**	Derive an expression for efficiency in otto cycle in terms of compression ratio with P-v diagram	**10 Marks**	**L2**	**CO6**
	b.	Discuss available and unavailable energy for reversible heat Engine with representation on Temperature Entropy Diagram	**10 Marks**	**L2**	**CO5**
		Or			
22.	**a.**	Derive an expression for efficiency for Diesel cycle in terms of compression ratio and cut off ratio	**10 Marks**	**L2**	**CO6**
	b.	Discuss the importance of entropy and prove that entropy is a property	**10 Marks**	**L2**	**CO5**