Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 29- 05-2026 **Time:**09:30am – 12:30pm

School: SOE	**Program:** B.Tech	
Course Code: MEC2515	**Course Name:** Applied Thermodynamics	
Semester: IV	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	12	14	14	16	22	22

Instructions:

(i) Use of STEAM TABLES is Allowed for this Course Examination.

(ii) Read all questions carefully and answer accordingly.

(iii) 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.	Name the processes during which heat is added in Otto and Diesel cycles.	**2 Marks**	**L2**	**CO1**
2.	Write the P-V and T-S diagrams for Dual cycle.	**2 Marks**	**L2**	**CO2**
3.	Explain the regeneration process in Brayton cycle.	**2 Marks**	**L2**	**CO2**
4.	Write the P-V and T-S diagrams for Brayton cycle with irreversibilities present in turbine and compressor.	**2 Marks**	**L2**	**CO3**
5.	List the functions of air in gas turbine cycle.	**2 Marks**	**L2**	**CO3**
6.	Write the T-S diagram for reheat Rankine Cycle.	**2 Marks**	**L2**	**CO4**
7.	Define Steam Rate in vapor power cycle.	**2 Marks**	**L2**	**CO4**
8.	Define one ton of refrigeration.	**2 Marks**	**L2**	**CO4**
9.	List few refrigerants used as working fluids in refrigerator	**2 Marks**	**L2**	**CO5**
10.	List the four basic components of refrigeration system.	**2 Marks**	**L2**	**CO6**

Part B

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

11.	Compare the thermal efficiencies of Otto, Diesel and Dual Cycle when the maximum cycle pressure and temperature are same in detail with P-V and T-S diagrams. Explain the comparison in detail.	**10 Marks**	**L2**	**CO1**
	Or			
12.	Explain the processes involved in the Carnot cycle and the Derive the thermal efficiency of Carnot cycle with T-S diagram.	**10 Marks**	**L2**	**CO1**
13.	An engine working on Otto cycle is supplied with air at 0.1 MPa, 35 ^{0}C. The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate (a) the maximum pressure and temperature of the cycle, (b) the cycle efficiency. (For air, C_p=1.005, C_v=0.718, and R=0.287 kJ/kg-K). Also draw the T-S diagram of the cycle.	**10 Marks**	**L3**	**CO2**
	Or			
14.	In an air-standard Diesel cycle, the compression ratio is 17, and at the beginning of isentropic compression, the temperature is 20 ^{0}C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process is 1500 ^{0}C. Calculate (a) the cut-off ratio, (b) the heat supplied per kg of air, (c) the cycle efficiency.	**10 Marks**	**L3**	**CO2**
15.	Write advantages and disadvantages of Closed gas cycle for gas turbine engines over open cycle gas turbine engine.	**10 Marks**	**L3**	**CO3**
	Or			
16.	Derive the thermal efficiency of Brayton cycle with P-V and T-S diagrams.	**10 Marks**	**L3**	**CO3**
17.	In a gas turbine plant working on Brayton cycle, the air at inlet is 30 °C, 0.1 MPa. The pressure ratio is 5.25 and the maximum temperature is 900 °C. The turbine and compressor efficiencies are each 85%. Find (a) compressor work, (b) turbine work, (c) heat supplied. Mass of air may be considered as 1 kg. Also draw the P-V and T-S diagrams.	**10 Marks**	**L4**	**CO4**
	Or			
18.	Consider an air standard cycle in which the air enters the compressor at 1.0 bar and 20°C. The pressure of air leaving the compressor is 3.5 bar and the temperature at turbine inlet is 600°C. Determine per kg of air : (i) Efficiency of the cycle, (ii) Heat supplied to air, (iii) Work available at the shaft. For air γ = 1.4 and Cp = 1.005 kJ/kg K. Also draw the P-V and T-S diagrams for Brayton cycle.	**10 Marks**	**L4**	**CO4**

19.	Most power plants in the world use vapor as working fluids for converting chemical energy associated with fuels into electrical energy which results in generation of power. Write the name of the cycle which is being used the in vapor power plants. Explain the cycle in brief and derive the thermal efficiency of the cycle with P-V and T-S diagrams for the same. Also discuss about the regeneration method to increase the thermal efficiency of this cycle.	**20 Marks**	**L3**	**CO5**
	Or			
20.	Steam at 18 bar, 400 ^{0}C is expanded in a steam turbine to 0.1 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assuming ideal processes, (a) find per kg of steam the network and the cycle efficiency (b) pump work (c) Heat added to the cycle (d) If the turbine and the pump have each 75% efficiency, find the cycle efficiency. Conditions at 18 bar and 400 ^{0}C are enthalpy is 3251.6 kJ/kg, entropy is 7.1814 kJ/kgK and at 0.1 bar conditions are specific volume is 0.001043 m^3/kg, h_f=417.51 kJ/kg, h_{fg}=2257.5 kJ/kg, h_g = 2675 kJ/kg, S_f=1.3028 kJ/kgK, S_{fg}=6.0562 kJ/kgK, S_g=7.3589 kJ/kgK.	**20 Marks**	**L3**	**CO5**

21.	**a.**	Explain the ideal vapor compression refrigeration cycle with schematic diagram and T-S diagram for it. Derive the Coefficient of performance of the VCR refrigeration system.	**10 Marks**	**L4**	**CO6**
	b.	Refrigerant 134a is the working fluid in a vapor compression heat pump that provides 35 kW to heat a dwelling on a day when the outside temperature is below freezing. Saturated vapor enters the compressor at 1.6 bar, and saturated liquid exits the condenser, which operates at 8 bar. Determine for isentropic compression (a) the refrigerant mass flow rate, in kg/s. (b) the compressor power, in kW. (c) the coefficient of performance.	**10 Marks**	**L4**	**CO6**
		Or			
22.	**a.**	The properties of refrigerants play an important role in the performance of refrigeration system. List and Elucidate the various properties of refrigerants for better performance of refrigeration system.	**10 Marks**	**L4**	**CO6**
	b.	Refrigerant 134a is the working fluid in an ideal vapor compression refrigeration cycle that communicates thermally with a cold region at 0°C and a warm region at 30°C. Saturated vapor enters the compressor at 0°C and saturated liquid leaves the condenser at 30°C. The mass flow rate of the refrigerant is 0.09 kg/s. Determine (a) the compressor power, in kW, (b) the refrigeration capacity, in tons, (c) the coefficient of performance.	**10 Marks**	**L4**	**CO6**