Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Engineering Thermodynamics **Semester : III**

Program: B Tech (Automotive Engineering) **Time : 03 hrs.**

Course Code: MECH2014 **Max. Marks: 100**

Instructions: Use of Steam Table is allowed.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Discuss the 'Concept of Continuum' and its relevance in study of thermodynamics.	**4**	**CO1**
Q 2	Define perpetual motion machine of second kind. Why is it impossible?	**4**	**CO1**
Q 3	Write down the two statements of 2nd law of thermodynamics and briefly discuss the application in the real life.	**4**	**CO2**
Q 4	Explain the term "saturation temperature."	**4**	**CO1**
Q 5	List down the major five differences between Otto and Diesel cycle.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A turbine operates under steady flow conditions, receiving steam at the following state: enthalpy 2785 kJ/kg, velocity 33.3 m/s and elevation 3 m. The steam leaves the turbine at the following state: enthalpy 2512 kJ/kg, velocity 100 m/s, and elevation 0 m. Heat is lost to the surroundings at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, what is the power output of the turbine in kW?	**10**	**CO3**
Q 7	Discuss the working of a refrigeration system. Draw the layout of the refrigeration components arrangement and explain their role.	**10**	**CO2**
Q 8	2 Kg of dry steam at 6.0 bar pressure and dryness fraction of 0.5 is heated, so that it become (a) 0.85 dry (b) Dry & saturated (c) Superheated to 300 °C. Determine the net heat supplied in each case.	**10**	**CO4**

Q 9	A mass of gas is compressed in a quasi-static process from 70 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3. Assuming that the pressure and volume are related by PV1.4 =constant, find the work done by the gas system. OR Find the co-efficient of performance and heat transfer rate in the condenser of a refrigerator in kJ/h which has a refrigeration capacity of 12000 kJ/h when power input is 0.75 kW.	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q 10	a steam power plant operates on a simple ideal Rankine cycle. Steam at 30 bar and 350 °C enters the turbine. The expansion is exhausted to a total condenser operating at a pressure of 75 kPa. The pump isentropically pressurizes and supplies water to boiler. Determine thermal efficiency of the cycle.	**20**	**CO4**
Q 11	5 kg of ice at -15°C is exposed to the atmospheric temperature of 25 °C. The ice melts and comes into thermal equilibrium. Determine the entropy increase of the universe. Take : cp of ice = 2.1 kJ/kg°C, Latent heat of fusion of ice = 350 kJ/kg. OR In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 35 °C and 0.1 MPa. The maximum temperature of the cycle is 1100 °C. Find (a) the temperature and the pressure at various points in the cycle, (b) the heat supplied per kg of air, (c) work done per kg of air,(d) the cycle efficiency and (e) the MEP of the cycle.	**20**	**CO3**