


Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, June 2021

Course: Engineering Thermodynamics

Program: B.Tech (Food Technology)

Course Code: MECH 1006

Semester: 2nd

Time: 03 hrs.

Max. Marks: 100

SECTION A

S. No.	MCQ/Short answer questions (1.5 marks each)	30 Marks	CO
Q.1	For water, as temperature increases, volume always increases? (a) True (b) False	1.5	CO1
Q.2	The specific heats of a perfect gas depend on its (a) Pressure (b) Volume (c) Temperature (d) Molecular weight	1.5	CO1
Q.3	Real gases behave as ideal gases (a) Only at very low pressure and low temperatures (b) Only at very high pressures and low temperatures (c) Only at very low pressure and high temperatures (d) At the critical point	1.5	CO1
Q.4	What is heat pump?	1.5	CO1
Q.5	A PMM2 is possible. (a) True (b) False	1.5	CO1
Q.6	The second law is not a deduction of the first law. (a) True (b) False	1.5	CO1
Q.7	The cyclic integral of entropy is ____ (a) One (b) Zero (c) Infinity (d) Cannot be determined	1.5	CO1
Q.8	What is PMM1?	1.5	CO1
Q.9	What do you mean by a free expansion process?	1.5	CO1
Q.10	Which of the following is true in regard to the energy of an isolated system? (a) $dQ \neq 0$ (b) $dW \neq 0$	1.5	CO2

	(c) $E=\text{constant}$ (d) all of the mentioned		
Q.11	For a reversible heat transfer and process being adiabatic, which of the following is true? (a) $dQ=0$ (b) $dS=0$ (c) $S=\text{constant}$ (d) All of the mentioned	1.5	CO2
Q.12	When does the entropy of a system become zero? (a) $W=0$ (b) $W=1$ (c) $W=-1$ (d) none of the mentioned	1.5	CO2
Q.13	In which of the following state does water exist? (a) Saturated solid state (b) Saturated liquid state (c) Saturated vapour state (d) All of the mentioned	1.5	CO2
Q.14	Distinguish between heat transfer and work transfer.	1.5	CO2
Q.15	Phase change occurs at (a) Constant pressure (b) Constant temperature (c) Constant pressure and temperature (d) None of the mentioned	1.5	CO3
Q.16	At a pressure below the triple point line, (a) The substance cannot exist in the liquid phase (b) The substance when heated transforms from solid to vapour (c) Both of the mentioned (d) None of the mentioned	1.5	CO3
Q.17	Energy is a (a) Point function (b) Property of the system (c) Extensive property (d) All of the mentioned	1.5	CO4
Q.18	The loss of exergy is more when, (a) The heat loss occurs at a higher temperature (b) The heat loss occurs at a lower temperature (c) Depends on the process (d) None of the mentioned	1.5	CO4
Q.19	Entropy principle is the quantitative statement of the second law of thermodynamics. (a) True (b) False	1.5	CO5
Q.20	For a gas, the compressibility factor Z depends on (a) Pressure and volume (b) Pressure and temperature	1.5	CO5

	(c) Volume and temperature (d) Pressure, volume and temperature		
SECTION B the word limit 20 marks 4 questions 5 marks each			
S. No.	Short Answer Type Question (5 marks each) Scan and Upload 4 questions 5 marks each	20 Marks	CO
Q.1	Can you describe an imaginary process that violates both the First law and second Laws of thermodynamics?	5	CO1
Q.2	To a closed system 150 kJ of work is supplied. If the initial volume is 0.6 m ³ and pressure of the system changes as $p = 8 - 4V$, where p is in bar and V is in m ³ , determine the final volume and pressure of the system. Assume any data, if missing.	5	CO2
Q.3	Derive an expression for the Joule-Thomson coefficient.	5	CO2
Q.4	A heat engine receives heat from a source at 1500K at a rate of 700kW, and it rejects the waste heat to medium at 320K. The measured output of the heat engine is 320kW and the environment temperature is 25°C. Determine (a) The reversible process (b) The rate of irreversibility (c) The 2 nd law efficiency of heat engine. Assume any data, if missing.	5	CO3
SECTION C 30 marks			
S. No.	Two questions, 15 marks each. Scan and Upload 2 questions 15 marks each	30 Marks	CO
Q.1	A refrigerator transfers heat from a low temperature medium (the refrigerated space) to a high temperature one (the room space). Is this a violation of the second law of thermodynamics? Explain.	15	CO4
Q.2	Four moles of ammonia gas are enclosed in a vessel of 5dm ³ capacity at 300K. Calculate the pressure of the gas in kilopascals (kPa) assuming that: (1) The gas behaves like an ideal gas (ii) The gas behaves like a real gas. Given that for ammonia $a=417\text{kPa}\cdot\text{dm}^6\text{mol}^{-2}$ and $b=37\text{cm}^3\text{mol}^{-1}$, $R=8.314\text{kPa}\cdot\text{dm}^3\text{K}^{-1}\text{mol}^{-1}$. Assume any data, if missing.	15	CO5
SECTION- D 20 marks			
S. No.	Long Answer type Questions Scan and Upload (10 marks each)	20 Marks	
Q.1	Discuss a pure substance. Is iced water a pure substance? Why?	3+7	CO3
Q.2	Define entropy. What do you understand by entropy principle? What are the causes of entropy increases?	2+3+5	CO5