

**Day and Date: Wednesday ,22/06/2022**

Seat No:

**Time: 9.30 am to 1.15 pm**

**Max. Marks- 100**

**Instructions:**

- Question No. 1 is compulsory.
- Figure to the right indicate full marks.
- Give suitable general Instructions
- Any other Course Specific Instructions.
- No questions should repeat from MSE/ISE

BT	CO's	Q. No.		Marks	Weight age
		<b>Q.1</b>	<b>Attempt the following</b>	<b>40</b>	
<b>BT L-2</b>	<b>CO1</b>	<b>a</b>	i) Explain in brief scope & limitation of thermodynamics?	<b>4</b>	<b>40%</b>
<b>BT L-3</b>	<b>CO1</b>		ii) The reading on a mercury manometer at 25°C (298.15K) (open to the atm. at one end) is 56.38cm. The local acceleration of gravity is 9.832m/s <sup>2</sup> . Atmospheric pressure is 101.78KPa. What is the absolute pressure in KPa being measured? The density of mercury at 25°C (298.15K) is 13.534 gm/cm <sup>3</sup>	<b>6</b>	
<b>BT L-1</b>	<b>CO1</b>	<b>b</b>	i) Define and Explain the following terms –i) Thermodynamic Processes ii) System and its classification iii) Boundary	<b>3</b>	
<b>BT L-1</b>	<b>CO1</b>		ii) State & Explain the Gibb's phase rule?	<b>3</b>	
<b>BT L-3</b>	<b>CO1</b>		ii) Heat in the amount of 5KJ is added to a system while its internal energy decreases by 10KJ. How much energy is transferred as work? For a process causing the same change of state but for which the work is zero, how much heat is transferred.	<b>4</b>	
<b>BT L-2</b>	<b>CO2</b>	<b>c</b>	i) Derive an expression for First law of thermodynamics for non flow process.	<b>5</b>	
<b>BT L-3</b>	<b>CO2</b>		ii) Liquid water at 180 (453.15k) and 1002.7 KPa has an internal energy (on an arbitrary scale) of 762.0 KJ/Kg. and a specific volume of 1.128 cm <sup>3</sup> /g. i) What is its enthalpy? ii) The water is brought to the vapor state at 300°C	<b>5</b>	

			(573.15) and 1500 KPa. Where its internal energy is 2784.4 KJ/Kg. and its sp. Volume is 169.7 cm <sup>3</sup> /g. Calculate ΔU and ΔH for the process.				
BT L-2	CO3	d	i) Drive expression for virial equation of state? Give its applications.  ii) An ideal gas initially at 303.15KJ & 100KPa, undergoes the following the cyclic process in a closed system. i.e In mechanical reversible process, It is first compressed adiabatically to 500 KPa , Then cooled at a constant pressure 500KPa to 303.15K, & finally expanded isothermally to its original state. Calculate Q, W, ΔU & ΔH for each step of the process and for the cycle. Take C <sub>p</sub> = ( 7/2) R and C <sub>v</sub> = ( 5/2) R, R= 8.314 J/K mol K.		5		
					5		
		Q.2	Attempt		20		
BT L-2	CO4	a	Explain the concept of entropy and derive expression for entropy?	Unit: 4	6		
BT L-3	CO4	b	Following heat engines produces power of 80,000 KW. Determine in each case the rates at which heat is absorbed from the hot reservoir and discarded to the cold reservoir. a) A carnot engine operates between heat reservoirs at 600 & 300 K. b) A practical engine operates between the same heat reservoirs but with a thermal efficiency η = 0.3		7		
BT L-2	CO4	c	Derive an expression for thermal efficiency of Carnot engine? What is the specialty of Carnot engine?		7		
							60%
		Q.3	Attempt (any four questions)		20		
BT L-2	CO5	a	Discus in detail about the maxwell's equations and its applications.	Unit: 5	5		
BT L-3	CO5	b	Show that, dU = C <sub>v</sub> .dT + [T(dP/dT) <sub>v</sub> -P] dV and dS = C <sub>v</sub> .dT/T + (dP/dT) <sub>v</sub> . dV		5		
BT L-3	CO5	c	Show that Gibb's energy is a generating function of all other thermodynamic properties.		5		
BT L-2	CO5	d	Drive the fundamental property relations for homogenous constant mass, constant composition system.		5		
BT L-2	CO5	e	Discus the thermodynamic diagrams with a neat sketch and also mention its importance.		5		
		Q.4	Attempt		20		
BT L-1	CO6	a	What are the practical limitations of carnot cycle for refrigeration?	Unit: 6	4		

<b>BT L-1</b>	<b>CO6</b>	<b>b</b>	Write note on internal combustion engine.		<b>4</b>	
<b>BT L-3</b>	<b>CO6</b>	<b>c</b>	<p>A vapour cooperation refrigerator emptying Freon – 12 works between pressure limit of 182.5 kPa and 960.6 kPa. The heat transfer from the condenser is found to be 72 kJ/min. and the heat absorbed in the evaporator is 3200 kJ/hr. The refrigeration vapor leaves the evaporator in the saturated state. Calculate:</p> <p>i) The refrigerant flow rate through the system in kg/min.</p> <p>ii) The energy input to the compressor</p> <p>The enthalpy of saturated vapor at 182.5 kPa =181.2 kJ/kg and the enthalpy of saturated liquid at 960.6 kPa = 76.2 kJ/kg.</p>		<b>6</b>	
<b>BT L-1</b>	<b>CO6</b>	<b>d</b>	Write a note on Heat Pump.		<b>6</b>	

**\*\*\*This is a Question Paper sample Template\*\*\***

**You are requested to ensure that,**

- The title block of the question paper is as per format
- The course name is correctly mentioned with correct course code as per S. Y. B. Tech syllabus structure.
- The name of the examination is correctly mentioned
- The instructions are appropriate and do not violate the present rules
- There can be variations in the Sub questions Marks, but the total of sub questions coming under main questions should not vary.
  - However internal options may be given to few sub questions with equal marks.
  - Optional questions should be in the range of 20 to 30% of the total marks of the questions paper (100 marks).
- Faculty should strictly follow the guidelines/instruction (attached with this format) while setting the question paper.**
- Use Times New Roman, 12 Bold, for main question and Times New Roman, 12, for Sub question.**