SIDDARTHA INSTITUTE SCIENCE AND TECHNOLOGY
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Thermodynamics (18ME0309) **Course & Branch**: B.Tech - ME

Year & Sem: II-B. Tech & II-Sem **Regulation:** R18

UNIT –I

1		What is a thermodynamic system? Explain different classes of systems with suitable examples.	L1, L2	10M
2	a)	Define the following a) Enthalpy b) Internal Energy	L1	5M
	b)	What is quasi static process? Explain in detail?	L2	5M
3	a)	List the difference between a closed system and an open system.	L4	5M
	b)	Compare the cyclic process and non-cyclic process.	L5	5M
4	a)	Define the following thermodynamic properties a) Pressure b) Temperature c) volume d) Density	L1	5M
	b)	What do mean by property? Distinguish between intensive and extensive	L1, L4	5M
5	a)	What is meant by thermodynamics equilibrium? Explains its types briefly.	L1, L2	5M
	b)	Recall thermodynamic system control volume.	L1	5M
6		Explain the different relationships with system and surroundings in detail.	L4	10M
7	a)	What do you understand by path function and point function? What are the exact and inexact differentials?	L2	5M
	b)	Show that work is a path function and not a property.	L2	5M
8		Classify different work transfers? Explain any three types.	L4	10M
9	a)	Classify the differences between heat and work transfers?	L4	5M
	b)	Explain about Heat transfer.	L2	5M
10		Explain the following terms		
		a) State	L2	2M
		b) Path	L2	2M
		c) Process	L2	2M
		d) Cyclic process	L2	2M
		e) System.	L2	2M

UNIT – II

1	a)	Explain zeroth law of thermodynamics.	L2	5M
	b)	Define Heat, Temperature and concept of thermal Equilibrium.	L1	5M
2	a)	Define first law of thermodynamics. Justify that internal energy is a property of the system.	L1, L5	5M
	b)	A Stationary mass of gas is compressed without friction from an initial state of 0.3 m^3 and 0.105 Mpa to a final state of 0.15 m^3 and 0.105 Mpa, the pressure remaining constant during the process. There is a transfer of 37.6 KJ of heat from the gas during the process. How much does the internal energy of the gas change?	L3	5M
3		A piston and cylinder machine contain a fluid system which passes through a complete cycle of four processes. During a cycle the sum of all heat transfer is -170 KJ. The system completes 100 cycles per min. Complete the following table showing the method for each item, and computes the net rate of work output in KW.	L3	10M

Process	Heat transfer in KJ/min	Work done in KJ/min	Change in internal energy KJ/min
1-2	0	2170	-
2-3	21,000	0	-
3-4	-2,100	-	-36,600
4-1	-	-	-

4	a)	Explain the First law of Thermodynamics' and Justify that for non-flow process.	L2, L5	5M
	b)	Define Statements of second law of thermodynamics i) Clausius statement ii) Kelvin-plank statement	L1	5M
5		What is Steady Flow Process? Derive SFEE for any one engineering system	L3	10M
6	a)	Compare heat engine and a reversed heat engine.	L5	5M
	b)	A heat engine receives heat at the rate of 1500 KJ/min and gives an output of 8.2 KW. Determine i) The thermal efficiency ii) The rate of heat rejection.	L3	5M
7	a)	Write a short note on i) reversibility and irreversibility ii) availability and unavailability.	L2	5M
	b)	Analyze the coefficient 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 0.75KW.	L3	5M
8		A Reversible Heat pump is used to maintain a temperature of 0^0 C in a refrigerator when it rejects the heat to the surrounding at 25^0 C. If the heat removal rate from the refrigerator is 1440 KJ/min i) determine the C.O.P of the machine and work input is required. ii) If the required input to run the pump is developed by a reversible engine which receives heat at 380^0C and reject heat to atm then determine the overall C.O.P of the system.	L5	10M

9	a)	Recall short notes on concept of change in entropy.	L1	4M
	b)	Gives an expression for entropy changes for open systems.	L3	6M
10		Explain the following terms		
	a)	What are the limitations of the First law of Thermodynamics?	L1	2M
	b)	Compare steady and unsteady flow process.	L2	2M
	c)	Write some examples of irreversible process.	L1	2M
	d)	Define thermal efficiency of a heat engine cycle.	L1	2M
	e)	Define the term Entropy.	L1	2M

UNIT – III

1		Recall a short note on a) Equation of Ideal gas b) Avogadro laws.	L1	10M
2		Prove that for an ideal gas C_p- C_v=R.	L5	10M
3		Develop the equation used for computing the entropy change of an Ideal gas.	L3	10M
4	a)	State and Explain Dalton law of partial pressure.	L2	5M
	b)	How the partial pressure in gas mixture related to mole fraction?	L4	5M
5		Develop the expression of work transfer for an ideal gas in reversible isothermal process.	L3	10M
6		A cylinder contains a 0.45m^3 of gas at 1x10^5 N/m^2 and 80^{0}C. The gas is compressed to volume of 0.13 m^3 the final pressure being 5x10^5 N/m^2 Determine i) The mass of gas ii) the value of index 'n' for compression iii) The increase in internal energy of the gas. iv) The heat received or rejected by the gas during the compression. Take γ =1.4, R=294.2 J/kg^{0}C.	L3	10M
7		A reversible adiabatic process begins at P_1=10 bar, $t_{1=}$300^{0}C and end with P_2=1 bar Find the specific volume and the work done per kg of fluid if a) the fluid is air b) the fluid is steam.	L1	10M
8		A fluid at 200 KPa and 300^{0}C has a volume of 0.8 m^3 .In a frictionless process at constant volume the pressure changes to 100 KPa.Find the final temperature and the heat transfer a) the fluid is air b) the fluid is steam.	L3	10M
9.	a)	What is a polytrophic process?	L1	4M
	b)	A fluid is having a temperature of 150^{0}C and a specific volume of 0.96 m^3/kg.Find for 1 kg of fluid, the work, heat transferred and final temperature if a) the fluid is air b) the fluid is steam.	L1	6M
10	a)	What is mole?	L1	2M
	b)	What is Avogadro law?	L1	2M
	c)	Define an Ideal gas.	L1	2M
	d)	What is Boltzmann constant?	L1	2M

	e)	What is an equation of state?	L1	2M

UNIT – IV

1.	a)	Develop an expression for Carnot Cycle and efficiency of cycle.	L3	5M
	b)	A carnot engine working between 400^0 C and 40^0 C produce 130 KJ of work. Determine i) The thermal efficiency. ii) the heat added iii) The entropy changes during the heat rejection process.	L3	5M
2.		Develop the expression for air standard efficiency, work done of an otto cycle.	L3	10M
3.	a)	Develop the expression for air standard efficiency for diesel engine.	L3	5M
	b)	The stroke and cylinder diameter of a compression ignition engine are 250mm and 150mm respectively. If the clearance volume is $0.0004m^3$ and fuel injection take place at constant pressure for 5% of the stroke. Determine the efficiency of the engine. Assume the engine working on the diesel cycle.	L4	5M
4		Develop an expression for air standard efficiency of dual combination cycle.	L6	10M
5		The swept volume of a diesel engine working on dual cycle is $0.0053m^3$. The maximum pressure is 65 bar. Fuel injection end at 5% of stroke. The temperature and pressure at the stroke of compression are 80^0 C and 0.9 bar. Determine efficiency of air take γ =1.4.	L4	10M
6		Build the phase equilibrium diagram for a pure substance P-T plot with relevant constant property line.	L6	10M
7		Build the phase equilibrium diagram for a pure substance T-S plot with relevant constant property line.	L6	10M
8	a)	Show the phase equilibrium diagram for a pure substance h-S plot with relevant constant property line.	L2	5M
	b)	Show the enthalpy, entropy and volume of steam at 1.4 MPa.	L2	5M
9	a)	Recall a short note on dryness fraction.	L1	5M
	b)	Find the saturation temperature change in specific volume and entropy during evaporation and latent heat of vaporization of steam at 1Mpa 380^0C.	L1	5M
10	a)	What is Pure substance?	L1	2M
	b)	What are saturation states?	L1	2M
	c)	What do you understand triple point?	L2	2M
	d)	What is critical state, critical pressure, and critical temperature?	L1	2M
	e)	What are cyclic and non cyclic heat engine?	L1	2M

UNIT – V

1	a)	Classify Boilers.	L4	6M
	b)	Give the comparison between fire tube and water tube boilers.	L4	4M
2		Explain with neat sketch the construction and working of bibcock and Wilcox boiler.	L2	10M
3		Explain with neat sketch the construction and working of following high pressure boiler a) lamont boiler b) Benson Boiler	L2	10M
4		Explain with help of neat diagram the fire tube boilers of Cochran boilers.	L2	10M
5		Explain with neat sketches of the following boiler mountings a) Water level Indicator b) pressure gauge	L2	10M
6		Explain with neat sketches of the following boiler mountings a) Fusible plug b) Blow off cock	L2	10M
7		Explain with neat sketch of super heater in boiler accessories.	L2	10M
8		Explain with neat sketch of super Economizer in boiler accessories.	L2	10M
9		Explain with neat sketch of super Air preheater in boiler accessories.	L2	10M
10	a)	Define the term availability.	L1	2M
	b)	What is function of boiler mounting?	L1	2M
	c)	How do accessories differ from mounting?	L1	2M
	d)	Define boiler.	L1	2M
	e)	What do you mean Irreversibility?	L1	2M

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