NARSIMHA REDDY ENGINEERING COLLEGE
UGC AUTONOMOUS INSTITUTION
NRCM
Your roots to success....
Maisammaguda (V), Kompally - 500100, Secunderabad, Telangana State, India

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Accredited by **NBA & NAAC** with **'A'** Grade
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MECHANICAL ENGINEERING

QUESTION BANK

Course Title   :Thermo Dynamics

Course Code   :23ME305PC

Regulation   :NR 23

Course Objectives: To understand the treatment of classical thermodynamics and to apply the first and second laws of thermodynamics to engineering applications

Course Outcomes (CO's): At the end of the course the student should able to

305.1. Understand the basics of thermodynamics

305.2. Apply first and second laws of thermodynamics to different systems

305.3. determine the feasibility of process w.r.t to entropy

305.4. Apply Thermodynamic process to real or ideal gases

305.5. Determine the efficiencies of gas power &vapour power cycles

UNIT–I
FUNDAMENTALS OF THERMODYNAMICS

S.No		Questions	BT	CO	PO
		Part – A (Short Answer Questions)			
1		Define Heat?	1	1	1
2		What are types of equilibrium?	1	1	1
3		What is reversible process?	1	1	1
4		What are exact and inexact differentials?	1	1	1
5		What are intensive &extensive properties?	1	1	1
6		What are differences between heat, work?	1	1	1
7		Show that heat is a path function and not a property	1	1	1
8		Define energy?	1	1	1
9		What are intensive properties?	1	1	1
10		Define zeroth law of thermodynamics?	1	2	1
		Part – B (Long Answer Questions)			
11	a)	Explain types of thermodynamic system?	2	1	1
	b)	What is a constant volume gas thermometer? Why is it preferred to a constant pressure gas thermometer?	2	2	1
12	a)	What is Quasi static process? explain with neat sketch?	3	2	1
	b)	2kg of gas at a pressure of 1.5 bar, Occupies a volume of 2.5 m3	4	2	1

			BT	CO	PO
		If this gas compresses isothermally to 1/3 times the initial volume. Find heat transfer work transfer			
13	a)	Explain neat sketch Quasistatic process?	5	1	1
	b)	What is different process?	2	1	1
14	a)	Explain microscopic and macroscopic view points	2	2	
	b)	Distinguish between change of state, path and process	2	2	1
15	a)	Explain different Thermodynamic Process?	3	2	1
	b)	explain different types of pressure	3	2	1
16	a)	What is the difference between the work transfer and heat transfer?	3	2	1
	b)	Explain Types scales?	2	2	1

UNIT–II
LAWS OF THERMODYNAMICS

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		What is PMM-I. Justify with reason whether it is feasible or not?	2	3	2
2		Define PMM2?	2	2	2
3		What are applications of SFEE?	1	3	2
4		What are the Limitations of first law of TD?	1	3	1
5		What is thermal reservoir?	1	3	1
6		Define Carnot theorem	1	3	1
7		define Thermal efficiency	1	2	1
8		define enthalpy	1	2	1
9		define entropy	1	2	1
10		Define Gibbs function	1	2	1
Part – B (Long Answer Questions)					
11	a)	Explain First law of thermodynamics.	1	3	2
	b)	Explain and derive Steady Flow Energy Equation.	2	3	2
12	a)	Explain Second Law of Thermodynamics. Prove that violation of Kelvin Plank statement leads to violation of Clausius statement.	2	3	2
	b)	A cyclic heat engine operates between a source temperature of 800 C and A Sink temperature of 300C.What is the least rate of heat Rejection per KW net output of the engine?	2	3	2
13	a)	Prove that the violation of Clausius statement leads to violation of Kelvin Plank statement.	3	3	2
	b)	An air compressor handles 6.0 m3/min of air with a density of 1.26 kg/m3and a pressure of 1.013 bar, and it discharges 450 kPa with a density of 4.86 kg/m3. The change in specific internal energy across the compressor is 82 kJ/kg and heat loss by cooling is24 kJ/kg. Neglecting KE and PE, find the work in kW	4	3	2
14	a)	Derive an expression for MAXWELLEQUATIONS?	2	3	2
	b)	What is the difference between steady flow and non – flow process?	2	2	1
15	a)	Discuss about Clausius Inequality	2	3	2
	b)	Derive the expression for efficiency of the Carnot cycle.	2	3	2
16	a)	Explain laws of thermodynamics	5	3	2
	b)	Explain joule experiment for first law of TD?	2	2	1

UNIT III

PURE SUBSTANCES

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		Define latent heat of ice?	1	2	1
2		What is pure substance?	1	2	1
3		What is saturation temperature and saturation pressure?	1	3	1
4		What is wet and dry steam?	1	3	1
5		Define dryness fraction of steam OR What is quality of steam?	1	3	1
6		Draw the P-V-T surface for water and discuss the triple point and critical point data on the diagram.	1	3	1
7		Examples of pure substances?	1	3	1
8		Explain specific heat?	1	3	1
9		What is superheated steam?	1	3	1
10		What is latent heat?	1	3	1
Part – B (Long Answer Questions)					
11	a)	Explain perfect gas laws	1	3	2
	b)	Write short notes on free expansion process	2	3	2
12	a)	What is the difference between critical point and triple point?	2	3	2
	b)	explain neat sketch bucket calorimeter	3	3	2
13	a)	Draw P-V diagram for water and a pure substance other than water	3	3	3
	b)	explain neat sketch throttling calorimeter	3	3	3
14	a)	Write the wander walls equation and point out its utility	2	3	3
	b)	explain separating calorimeter	4	3	3
15	a)	Draw the phase equilibrium diagram for a pure substance on T-s plot with relevant constant property lines.	4	3	3
	b)	Explain the terms, Degree of super heat, degree of sub-cooling	3	3	3
16	a)	Explain Dalton's law of partial pressure	2	3	2
	b)	Steam initially at 2 MPa, 3000C expands reversibly and adiabatically in a steam turbine to 500C. Determine the ideal work output of the turbine per kg of steam?	3	3	3

UNIT–IV

PERFECT GAS MIXTURES &PSYCHROMETRY

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		What is the important psychometric process?	1	4	3
2		What is meant by specific humidity?	1	4	3
3		Explain the thermodynamic process	1	4	3
4		Define mole fraction and mass fraction?	1	4	3
5		Distinguish between Universal Gas constant and Characteristic Gas constant?	1	4	3
6		What are properties of moist air?	1	4	3
7		define DBT	1	4	3
8		Define Humidity	1	4	3
9		Define mole	1	4	3
10		define joules law	1	4	3
Part – B (Long Answer Questions)					
11	a)	Compare and contrast the Gravimetric and volumetric analysis	2	4	4
	b)	Explain dew point meter	2	4	4
12	a)	Draw Psychometric chart and show psychometric processes in the chart.	3	4	4
	b)	Explain ideal gas laws?	3	4	4
13	a)	What do you understand by saturated and unsaturated air? State the various properties of air?	3	4	4
	b)	Explain with neat sketch sling psychrometer?	3	4	3
14	a)	State universal gas constant Hypothesis.	3	4	3
	b)	A gas mixture contains 1 Kg of O2 and 3 Kg of N2. The pressure and temperature of the mixture are 1 bar and 27degC.Determine: Mass fraction and mole fraction of each gas	4	4	3
15	a)	Write about Psychometric properties of atmospheric air	3	4	3
	b)	Define Sensible cooling	4	4	3
16	a)	Explain Psychometric processes	4	4	3
	b)	Explain mole fraction	4	4	3

UNIT–V
POWER CYCLES

S.No		Questions	BT	CO	PO
		Part – A (Short Answer Questions)			
1		What is a ton of refrigeration?	1	5	2
2		What is an air standard cycle? Why are such cycles conceived?	2	5	2
3		Draw the P-V and T-S diagram of Lenoir cycle.	2	5	2
4		Compare Otto and Dual cycle	2	5	2
5		Define swept volume	2	5	2
6		Compare Otto and Diesel cycle for the same maximum pressure and Temperature.	2	5	2
7		Draw the P-V and T-S plots of Otto cycle.	2	5	2
8		Explain the Diesel cycle with the help of P-V and T-S diagrams.	2	5	2
9		Explain in the working of cannot cycle and derive the expression for its thermal efficiency.	2	5	2
10		Compare Carnot and Rankine cycles	2	5	2
		Part – B (Long Answer Questions)			
11	a)	Derive an expression for thermal efficiency of Otto cycle	3	5	4
	b)	An engine works on a diesel cycle with an Inlet pressure and temperature of 1 bar and17 deg C. The pressure at the end of the adiabatic compression is 35 bar. The ratio of expansion, i.e. after constant pressure heat addition is 5. Calculate the heat addition, heat rejection and efficiency of the cycle. Assume r=1.4	5	5	4
12	a)	Explain the working of Atkinson Cycle.	3	5	4
	b)	Explain the working of Bell- Coleman cycle	3	5	4
13	a)	Draw the variation of thermal efficiency against compression ratio of an Otto-cycle.	4	5	4
	b)	Explain Dual cycle	4	5	4
14	a)	With a neat sketch explain simple VCR system	3	5	4
	b)	Define mean effective pressure and thermal efficiency of an air standard cycle.	3	5	3
15	a)	Explain the working of Carnot Cycle.	3	5	3
	b)	Explain the working of Diesel cycle	4	5	3
16	a)	Explain the working of Rankine cycle	3	5	3
	b)	Explain the working of combination cycle	3	5	3

* **Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing; L5 – Evaluating; L6 – Creating)

Prepared By:

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