INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**ENGINEERING THERMODYNAMICS**
Course Code	:	**AAEB02**
Program	:	**B.Tech**
Semester	:	**III**
Branch	:	**Aeronautical Engineering**
Section	:	**A, B**
Academic Year	:	**2019 - 2020**
Course Faculty	:	**Mr. R Sabari Vihar, Assistant Professor** **Mrs. M Shravani, Assistant Professor**

COURSE OBJECTIVES:

I	Understand the laws of thermodynamics and determine thermodynamic properties, gas laws.
II	Apply knowledge of pure substances, mixtures, usage of steam tables and Mollier chart, psychrometric charts.
III	Understand the direction law and concept of increase in entropy of universe.
IV	Understand the working of ideal air standard, vapour cycles and evaluate their performance in open systems like steam power plants, internal combustion engines, gas turbines and refrigeration systems.
V	Understand the basic concepts of heat transfer and working and types of heat exchangers.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
MODULE-I						
1	What is a system?	A small part of the universe to which we will apply the laws of thermodynamics. We call this subset a system.	Remember	CO 1	CLO 1	AAEB02.01
2	What is a Closed system?	A system in which no mass is permitted to cross the system boundary.	Remember	CO 1	CLO 1	AAEB02.01
3	What is a Open system?	Open system is one in which mass crosses the system boundary in either direction from the system to surroundings or vice versa.	Remember	CO 1	CLO 1	AAEB02.01
4	What is a isolated system?	Isolated system is one in which there is no interaction between system and the surroundings. It is of fixed mass and energy, and hence there is no mass and energy transfer across the system boundary.	Remember	CO 1	CLO 1	AAEB02.01
5	What is	In macroscopic approach, certain	Remember	CO 2	CLO 2	AAEB02.02

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	macroscopic approach?	quantity of matter is considered, without a concern on the events occurring at the molecular level.				
6	What is microscopic approach?	In microscopic approach, the effects at molecular level are considered.	Remember	CO 1	CLO 2	AAEB02.02
7	Define Quasi static process.	A quasi-static process is one in which the deviation from thermodynamic equilibrium is infinitesimal, all states of the system passes through are equilibrium states	Remember	CO 1	CLO 2	AAEB02.02
8	Define temperature.	Temperature is a property of a system which determines the degree of hotness and is a relative term.	Remember	CO 1	CLO 2	AAEB02.02
9	Explain Thermal equilibrium?	Two systems are said to be equal in temperature, when there is no change in their respective observable properties when they are brought together. In other words, "when two systems are at the same temperature they are in thermal equilibrium"	Understand	CO 1	CLO 2	AAEB02.02
10	What is a perfect gas?	An ideal gas, also known as a perfect gas. is a gas that acts according to an idealized relationship between volume, pressure, and temperature.	Remember	CO 1	CLO 2	AAEB02.02
11	What is thermometric property?	The thermometer makes use of a physical property of a thermometric substance which changes continuously with temperature. The physical property is referred to as thermometric property.	Remember	CO 1	CLO 2	AAEB02.02
12	What is flow work?	It is the work required to push the fluid into or out of the control volume. Flow work is necessary for maintaining the continuous flow through control volume.	Remember	CO 1	CLO 2	AAEB02.02
13	Define enthalpy.	A thermodynamic quantity equivalent to the total heat content of a system is called enthalpy. $H = U + pV$, Where, H is the enthalpy of the system, U is the internal energy of the system, p is the pressure of the system, V is the volume of the system	Remember	CO 1	CLO 2	AAEB02.02
14	Define is specific heat.	The amount of heat required to raise a unit mass of a substance through a unit rise in temperature.	Remember	CO 1	CLO 3	AAEB02.03
15	Define latent heat.	The amount of heat transfer required to cause a phase change in unit mass of a substance at a constant pressure and temperature.	Remember	CO 1	CLO 3	AAEB02.03
16	What is	A continuous sequence in which	Remember	CO 1	CLO 3	AAEB02.03

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	continuum?	adjacent elements are not perceptibly different from each other, but the extremes are quite distinct is called as continuum.				
17	What is a cyclic process?	When a system returns to its original state after completing a series of change, then it is known that a cyclic is completed.	Remember	CO 1	CLO 2	AAEB02.02
18	What is a non cyclic process?	When a system doesn't returns to its original state because of irreversibility's present in system like friction, then such type of process is known as non- cyclic process.	Remember	CO 1	CLO 1	AAEB02.01
19	What is 'Path'?	The series of states a system passes through during a process is called as path.	Remember	CO 1	CLO 2	AAEB02.02
MODULE-II						
1	What is a steady flow process?	Steady flow process is a process where: the fluid properties can change from point to point in the control volume but remains the same at any fixed point during the whole process. A steady-flow process is characterized by the following: 1) No properties within the control volume change with time. That is m_{cv} = constant and E_{cv} = constant 2) No properties change at the boundaries with time. Thus, the fluid properties at an inlet or exit will remain the same during the whole process. They can be different at different opens. 3) The heat and work interactions between a steady-flow system and its surroundings do not change with time.	Remember	CO 2	CLO 4	AAEB02.04
2	What are homogeneous system?	A system is homogeneous when it is completely uniform throughout, i.e. consists of one phase only	Remember	CO 2	CLO 5	AAEB02.05
3	What are heterogeneous system?	A system is heterogeneous when it is not uniform throughout, i.e. it consists of two or more phases, e.g., a mixture of two solids or two or more immiscible liquids, a solid in contact with a liquid	Remember	CO 2	CLO 7	AAEB02.07
4	What are state variables?	The macroscopic properties of a system are state variables since change in any of these properties, causes the system to change into another state	Remember	CO 2	CLO 4	AAEB02.04
5	Define	The process in which heat is given	Remember	CO 2	CLO 4	AAEB02.04

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	exothermic process.	out to the surroundings is called exothermic process. In this process, products are more stable than reactants because they have lower energy.				
6	What is a State function?	The thermodynamic property which depends upon initial and final state of the system d not on the means how the state is reached are state functions, e.g., E, H, S, G are state functions	Remember	CO 2	CLO 5	AAEB02.05
7	What is a thermal energy reservoir?	A large body of infinite heat capacity, which is capable of absorbing or rejecting an unlimited quantity of heat without suffering appreciable changes in its thermodynamic coordinates.	Remember	CO 2	CLO 5	AAEB02.05
8	What is a heat pump?	A heat pump is a device that transfers heat energy from a source of heat to what is called a heat sink. Heat pumps move thermal energy in the opposite direction of spontaneous heat transfer, by absorbing heat from a cold space and releasing it to a warmer one	Remember	CO 2	CLO 5	AAEB02.05
9	Explain entropy?	A measure of the level of disorder of a system is entropy, represented by S. For a thermodynamic system involved in a heat transfer of size Q at a temperature T , a change in entropy can be measured by: $\Delta S = Q/T$	Understand	CO 2	CLO 7	AAEB02.07
10	What is a reversible processes?	A thermodynamic process is reversible if the process can return back in such a that both the system and the surroundings return to their original states, with no other change anywhere else in the universe. It means both system and surroundings are returned to their initial states at the end of the reverse process.	Remember	CO 2	CLO 7	AAEB02.07
11	What is a irreversible process?	An irreversible process is a thermodynamic process that departs from equilibrium. In terms of pressure and volume, it occurs when the pressure (or the volume) of a system changes dramatically and instantaneously that the volume (or the pressure) do not have the time to reach equilibrium.	Remember	CO 2	CLO 7	AAEB02.07
12	Explain internally irreversible process?	The process is internally reversible if no irreversibility's occur within the boundaries of the system. In these processes, a system undergoes through a series of equilibrium states, and when the process reverses, the system passes through exactly the same	Understand	CO 2	CLO 4	AAEB02.04

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		equilibrium states while returning to its initial state.				
13	Explain externally irreversible process?	In externally reversible process no irreversibility's occur outside the system boundaries during the process.	Understand	CO 2	CLO 4	AAEB02.04
14	What is Gibbs function?	Gibbs function is also known free enthalpy to distinguish it from Helmholtz free energy is a thermodynamic potential that can be used to calculate the maximum of reversible work that may be performed by a thermodynamic system at a constant temperature and pressure	Remember	CO 2	CLO 4	AAEB02.04
15	Explain Clausius theorem?	The Clausius theorem is a mathematical explanation of the second law of thermodynamics. Also referred to as the "inequality of Clausius", explain the relationship between the heat flow in a system and the entropy of the system and its surroundings.	Understand	CO 2	CLO 4	AAEB02.04
16	What is Clausius in equality?	The Clausius in equality states that the cyclic integral of dQ/T is always less than or equal to zero	Remember	CO 2	CLO 4	AAEB02.04
17	What is heat transfer rate?	A measured amount of heat transferred (ΔQ) over a measured amount of time (Δt) $H = \frac{kA\Delta T}{L}$, where: ΔT: temperature difference between the ends of the object, k: thermal conductivity of the material, L: material length, and A: material cross-sectional area.	Remember	CO 2	CLO 4	AAEB02.04
MODULE-III						
1	Define pure substance.	A pure substance is one composed o a single chemical species, which may exist in more than one phase. Different phases of a substance have the same chemical composition but different physical structures, such as solid, liquid, and gas.	Remember	CO 3	CLO 8	AAEB02.08
2	What is a real gas?	This gas does not obey the ideal gas law. Because inter molecular forces and volume occupied by the gas molecules are considered.	Remember	CO 3	CLO 10	AAEB02.10
3	Define triple point.	In chemistry and physics, the triple point is the temperature and pressure at which solid, liquid, and vapor phases of a particular substance coexist in equilibrium.	Remember	CO 3	CLO 8	AAEB02.08
4	Define critical	Critical point is defined as a point	Remember	CO 3	CLO 9	AAEB02.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	point.	of a liquid where is no distinction between saturated liquid and saturated vapour state.				
5	What is a T-S diagram?	A T-S diagram most frequently used to analyze energy transfer system cycles. This is because the work done by or on the system and the heat added to or removed from the system can be visualized on the T-S diagram.	Remember	CO 3	CLO 8	AAEB02.08
6	What is a H-S chart?	H-S chart is also known as an enthalpy–entropy chart plots the total heat against entropy, describing the enthalpy of a thermodynamic system.	Remember	CO 3	CLO 9	AAEB02.09
7	What is phase change?	The term phase transition (or phase change) is most commonly used to describe transitions between solid, liquid, and gaseous states of matter	Remember	CO 3	CLO 11	AAEB02.11
8	Define Molar heat.	It is defined as the quantity of heat required to raise the temperature of one mole of a gas through one degree.	Remember	CO 3	CLO 11	AAEB02.11
9	Define wet steam.	The mixture of dry steam and moisture is called wet steam.	Remember	CO 3	CLO 8	AAEB02.08
10	What is dryness fraction?	The quality of wet steam is defined by the dryness fraction. It is denoted by 'x' and x = Mass of dry steam / Mass of dry steam + Mass of wet steam	Remember	CO 3	CLO 8	AAEB02.08
11	What is 'Psychrometrics'?	'Psychrometrics' is given to the study of properties of air-water vapour mixtures?	Remember	CO 3	CLO 11	AAEB02.11
12	What is Dry Bulb Temperature (DBT)?	The dry-bulb temperature (DBT) is the temperature of air measured by a thermometer freely exposed to the air, but shielded from radiation and moisture. DBT is the temperature that is usually thought of as air temperature, and it is the true thermodynamic temperature. It indicates the amount of heat in the air and is directly proportional to the mean kinetic energy of the air molecules.	Remember	CO 3	CLO 9	AAEB02.09
13	What is Wet Bulb temperature (WBT)?	The wet-bulb temperature (WBT) is the temperature read by a thermometer covered in water-soaked cloth (wet-bulb thermometer) over which air is passed at 100% relative humidity.	Remember	CO 3	CLO 8	AAEB02.08
14	What is Dew point temperature?	The dew point is the temperature to which air must be cooled to become saturated with water vapour. When further cooled, the airborne water vapor will condense to form liquid water	Remember	CO 3	CLO 11	AAEB02.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		(dew).				
15	What is 'Specific humidity'?	Specific humidity, mass of water vapour in a unit mass of moist air, usually expressed as grams of vapour per kilogram of air, or, in air conditioning, as grains per pound.	Remember	CO 3	CLO 9	AAEB02.09
16	What is 'Relative humidity'?	Relative humidity (RH) is the ratio of the partial pressure of water vapor to the equilibrium vapor pressure of water at a given temperature.	Remember	CO 3	CLO 8	AAEB02.08
17	Define degree of saturation.	Degree of saturation is the percentage of water that occupies the pore spaces present in soil and is said to be degree of saturation.	Remember	CO 3	CLO 10	AAEB02.10
18	What is adiabatic saturation temperature?	Adiabatic saturation temperature refers to a temperature at which water converts into air by the process of evaporation adiabatically.	Remember	CO 3	CLO 9	AAEB02.09
19	What is Degree of saturation?	The degree of saturation(μ) is the ratio of the humidity ratio W to the humidity ratio of a saturated mixture Ws at the same temperature and pressure	Remember	CO 3	CLO 8	AAEB02.08
20	What is sensible heating and sensible cooling?	Heating or cooling without change in humidity is defined as Sensible heating and Sensible cooling.	Remember	CO 3	CLO 10	AAEB02.10
MODULE-IV						
1	What is a intercooler?	An intercooler is any mechanical device used to cool a fluid, including liquids or gases, between stages of a multi-stage compression process.	Remember	CO 4	CLO 12	AAEB02.12
2	What is a thermodynamic cycle?	A thermodynamic cycle consists of a linked sequence of thermodynamic processes that involve transfer of heat and work into and out of the system, while varying pressure, temperature, and other state variables within the system, and that eventually returns the system to its initial state.	Remember	CO 4	CLO 12	AAEB02.12
3	What are power cycles?	Power cycles are cycles which convert some heat input into a mechanical work output.	Remember	CO 4	CLO 12	AAEB02.12
4	What is a polytropic process?	The polytropic process equation can describe multiple expansion and compression processes which include heat transfer. A polytropic process is a thermodynamic process that obeys the relation: $pV^n = C$	Remember	CO 4	CLO 13	AAEB02.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		where p is the pressure, V is volume, n is the polytropic index , and C is a constant.				
5	What is a refrigerant?	A refrigerant is a substance or mixture, usually a fluid, used in a heat pump and refrigeration cycle. In most cycles it undergoes phase transitions from a liquid to a gas and back again. Many working fluids have been used for such purposes. Refrigerants used in various applications are ammonia, sulfur dioxide, and non-halogenated hydrocarbons such as propane.	Remember	CO 4	CLO 14	AAEB02.14
6	Explain thermal efficiency.	The thermal efficiency (η_{th}) is a dimensionless performance measure of a device that uses thermal energy. For a heat engine, thermal efficiency is the fraction of the energy added by heat (primary energy) that is converted to net work output (secondary energy). For a heat engine, thermal efficiency is the fraction of the energy added by heat (primary energy) that is converted to net work output (secondary energy). In the case of a refrigeration or heat pump cycle, thermal efficiency is the ratio of net heat output for heating, or removal for cooling, to energy input (the coefficient of performance).	Understand	CO 4	CLO 12	AAEB02.12
7	What is mean effective pressure?	A parameter used by engineers to describe the performance of reciprocating piston engines is known as the mean effective pressure. It is a measure of an engine's capacity to do work that is independent of engine displacement. $\text{MEP} = \frac{\text{Net Work for one cycle}}{\text{Displacement volume}}$	Remember	CO 4	CLO 14	AAEB02.14
8	What are Colligative properties?	Colligative properties are properties independent of the nature of the compounds and depend on the numbers of the solute particles only. Ex: boiling point elevation, freezing point depression, vapor pressure lowering, etc.	Remember	CO 4	CLO 14	AAEB02.14
9	Explain the term cut off ratio.	The ratio of the cylinder volumes before and after the combustion process in a diesel engine.	Understand	CO 4	CLO 13	AAEB02.13
10	What is coefficient of	A measure of the efficiency of a heat pump. The coefficient of	Remember	CO 4	CLO 12	AAEB02.12

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	performance of a heat pump?	performance of a heat pump is defined as the fraction of the desired output over the required input of the heat pump.				
11	Explain the term Coefficient of Performance of a Refrigerator.	Coefficient of performance of a refrigerator is the efficiency of a refrigerator and is defined as the fraction of the desired output over the required input of the refrigerator.	Understand	CO 4	CLO 14	AAEB02.14
12	What is Cold-air-standard assumption?	Cold-Air-Standard Assumption - Used to simplify the analysis of gas cycles Includes all of the air-standard assumptions in addition to the assumption that the working fluid(air) has constant specific heats.	Remember	CO 4	CLO 13	AAEB02.13
13	What is utilization factor?	Utilization factor is the ratio of the sum of net work output plus process heat delivered over the total heat input of a cogeneration plant.	Remember	CO 4	CLO 12	AAEB02.12
14	What is efficiency of Carnot cycle?	Carnot cycle efficiency = $\frac{T1-T2}{T1}$	Remember	CO 4	CLO 12	AAEB02.12
15	What is a Binary cycle?	A binary cycle power plant is a type of geothermal power plant that allows cooler geothermal reservoirs to be used than is necessary for dry steam and flash steam plants.	Remember	CO 4	CLO 13	AAEB02.13
MODULE-V						
1	What are the three modes by which heat is transferred?	There are three modes in which heat may be transferred: (a) conduction, (b) convection and (c) radiation.	Remember	CO 5	CLO 15	AAEB02.15
2	What is conduction?	Conduction refers to the transfer of heat between two bodies or two pans of the same body through molecules which are more or less stationary.	Remember	CO 5	CLO 15	AAEB02.15
3	What is convection?	Convection heat transfer occurs because of the motion of a fluid past a heated surface-the faster the motion, the greater the heat transfer.	Remember	CO 5	CLO 15	AAEB02.15
4	What is radiation?	Radiation heat transfer is the result of electromagnetic radiation emitted by a surface because of the temperature of the surface.	Remember	CO 5	CLO 15	AAEB02.15
5	What is thermal conductivity?	K is the constant of proportionality which is a property of the material through which heat is being conducted and is known as thermal conductivity.	Remember	CO 5	CLO 15	AAEB02.15
6	What is a heat exchanger?	A heat exchanger is a device in which heat is transferred between	Remember	CO 5	CLO 15	AAEB02.15

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		two moving fluids.				
7	Depending on direction of motion of two fluids classify heat exchangers.	Heat exchangers may be parallel flow. Counter flow or cross flow, depending upon the direction of the motion of the two fluids	Remember	CO 5	CLO 15	AAEB02.15
8	Define compressor.	Compressors are work absorbing devices which are used for increasing pressure of fluid at the expense of work done on fluid.	Remember	CO 5	CLO 16	AAEB02.16
9	Define Mean effective pressure.	The ratio of work-done per cycle to the stroke volume of the compressor is known as Mean effective pressure.	Remember	CO 5	CLO 16	AAEB02.16
10	What is a centrifugal compressor?	If the flow of air through the compressor is perpendicular to its axis, then it is a centrifugal compressor	Remember	CO 5	CLO 16	AAEB02.16
11	What is the overall thermal efficiency of an ideal gas turbine plant?	$1 - (1/r)^{\gamma-1/\gamma}$	Remember	CO 5	CLO 16	AAEB02.16
12	Define the overall isothermal efficiency of the compressor.	It is the ratio of Isothermal power to the shaft power or B.P. of the motor or engine required to drive the compressor	Remember	CO 5	CLO 16	AAEB02.16
13	What is a After-cooler?	After cooler is used to Cause moisture and oil vapour to drop out	Remember	CO 5	CLO 16	AAEB02.16
14	What is Volumetric efficiency?	The ratio of the volume of free air delivery per stroke to the swept volume of the piston, is known as volumetric efficiency.	Remember	CO 5	CLO 16	AAEB02.16
15	Define ratio of compression.	The ratio of Absolute discharge pressure to the absolute intake pressure.	Remember	CO 5	CLO 16	AAEB02.16

Signature of the Faculty **HOD, AE**