INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**ELEMENT OF MECHANICAL ENGINEERING**
Course Code	:	**AME551**
Program	:	B.Tech
Semester	:	VI
Branch	:	Mechanical Engineering
Course Faculty	:	Mr. G. Sarat Raju, Assistant Professor.

OBJECTIVES:

The course should enable the students to:	
I	Familiarize with fundamentals of mechanical systems.
II	Understand and appreciate the significance of mechanical engineering in different fields of engineering
III	Understand of application and usage of various engineering materials.

Course Outcomes:

The course should enable the students to:	
CO 1	Understand the laws of thermodynamics and determine thermodynamic properties, gas laws.
CO 2	Visualize the basics of thermodynamics and components of a thermal power plant.
CO 3	Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
CO 4	Understand the concepts various metals cutting machines like lathe describe various driving mechanisms of lathe.
CO 5	Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S No	QUESTION	ANSWER	Blooms Level	CO's	CLO	CLO Code
UNIT-I INTRODUCTION TO ENERGY SYSTEMS						
1	Define System?	A portion of universe which is under investigation, e.g., portion of test tube where reaction is taking place, is called system	Remember	CO 1	CLO 01	AME551.01
2	Define surroundings?	The rest of the universe which might be in a position to exchange energy and matter with the system is called the surroundings	Understand	CO 1	CLO 02	AME551.02
3	What is boundary?	The system is separated from the surroundings by a boundary which may be real or imaginary.	Remember	CO 1	CLO 01	AME551.01

4	Define Isolated system?	Isolated system is one that can transfer neither matter nor energy to and from, its surroundings	Understand	CO 1	CLO 03	AME551.03
5	Define closed system?	The boundary is sealed but not insulated. Therefore, A closed system is one which cannot transfer matter but can transfer energy in the form of heat, work and radiation to and from its surroundings.	Remember	CO 1	CLO 01	AME551.01
6	Define open system?	An open system is one which can transfer both energy and matter to and from its surroundings.	Understand	CO 1	CLO 02	AME551.02
7	What is state variables	The state of a system changes with the change in any of the macroscopic properties, these are called state variables	Remember	CO 1	CLO 03	AME551.03
8	What is state extensive property?	An extensive property of a system is that which depends upon the amount of the substance or substances present in the system. The examples are mass, volume, energy, heat capacity, enthalpy, entropy, free change etc.	Understand	CO 1	CLO 02	AME551.02
9	Define Isolated system?	Isolated system is one that can transfer neither matter nor energy to and from, its surroundings.	Remember	CO 1	CLO 02	AME551.02
10	What intensive property?	An intensive property of a system is that which is independent of the amount of the substance present in the syste1′n.The examples are temperature, pressure, density, viscosity, refractive index, surface tension and specific heat.	Remember	CO 1	CLO 01	AME551.01
11	What is a Isothermal process?	T remains constant): It is the process in which the temperature of the system remains constant during each step. In such a process the systems are in thermal contact with a constant temperature and both exchange heat with surroundings.	Remember	CO 1	CLO 02	AME551.02
12	What is a Zeroth law of thermodynamics?	Zeroth law of thermodynamics states that if system A is in thermal equilibrium with system B, and system B is in thermal equilibrium with system C, then system C is also in thermal equilibrium with system A (TA = TB = TC).	Understand	CO 1	CLO 03	AME551.03
13	What is a first law of thermodynamics?	First law of thermodynamics states that in closed system the internal energy can be changed by work or heat only, i.e., $\Delta U = q+w$	Remember	CO 1	CLO 01	AME551.01
14	Define Entropy	Entropy - A measure of molecular disorder	Remember	CO 1	CLO 02	AME551.02

15	What is Extensive Property?	Extensive Property - A property dependent on the size or extent of the system.	Understand	CO 1	CLO 02	AME551.02
16	What is Ideal Cycle?	Ideal Gas Law - An equation of state that is generally accurate only at low pressure and/or high temperature. The ideal gas law states that: PV = nRT where P = pressure, V = volume, n = number of moles, R = universal gas constant, and T = temperature	Remember	CO 1	CLO 01	AME551.01
17	Define Ideal Rankine Cycle?	Ideal Rankine Cycle - An ideal Rankine cycle does not involve any internal irreversibility's and consists of the following four processes: 1-2, isentropic compression in a pump; 2-3, heat addition in a boiler at constant pressure; 3-4, isentropic expansion in a turbine; 4-1, heat rejection in a condenser at constant pressure.	Understand	CO 1	CLO 02	AME551.02
18	What is Isentropic Process?	Internally Reversible Adiabatic Process (Isentropic Process) - A process that involves no heat transfer (adiabatic) and no irreversibility's within the system (internally reversible). The entropy of a fixed mass must remain constant during an isentropic process.	Understand	CO 1	CLO 01	AME551.01
19	List out different of energy systems	Solar, wind, bio fuels, tidal are some of the energy systems.	Remember	CO 1	CLO 03	AME551.03
20	What are macroscopic properties?	The properties associated with a macroscopic system are called macroscopic properties. These properties are pressure, volume, temperature, composition, density, viscosity, surface tension, refractive index, color.	Understand	CO 1	CLO 02	AME551.02
UNIT-II STEAM TURBINES, HYDRAULIC MACHINES						
1	What is pure substance	Pure substance is a substance which has a fixed chemical composition throughout its mass.	Understand	CO 2	CLO 04	AME551.04
2	Define Dryness fraction of steam	It is defined as the ratio of the mass of the total steam actually present to the mass of the total system.	Remember	CO 2	CLO 05	AME551.05
3	What are the wet and dry steams	The steam which partially evaporated and having water particles in suspension is called wet steam. he steam which fully in evaporated state and is not having any water particles is called dry steam.	Remember	CO 2	CLO 06	AME551.06
4	What is meant by superheated steam and states the uses.	The dry steam is further heated, then the process is called superheating and steam obtained	Understand	CO 2	CLO 05	AME551.05

		is known as superheated steam.				
5	What is meant by work ratio?	It is defined as the ratio of network transfer to the positive work transfer.	Remember	CO 2	CLO 05	AME551.05
6	Name the different process of Rankine cycle?	1-2: Isentropic expansion 2-3: Constant pressure and temperature heat rejection 3-4: Water is pumped to boiler pressure. 4-5: Constant pressure heat addition in boiler up to saturation temperature. 5-1: Constant pressure and temperature in boiler.	Remember	CO 2	CLO 04	AME551.04
7	What are the different types of steam available?	1) Wet steam 2) Dry saturated steam 3) Superheated steam	Understand	CO 2	CLO 05	AME551.05
8	Define efficiency of a Rankine cycle.	The efficiency of a Rankine cycle is defined as the ratio of net power developed to the heat supplied	Remember	CO 2	CLO 05	AME551.05
9	Define enthalpy of steam.	Enthalpy of steam is the sum of heat added to the water from the freezing point to saturation temperature and the heat absorbed during evaporation.	Remember	CO 2	CLO 05	AME551.05
10	What is the principle of operation of steam power plant?	The Rankine cycle is an idealized thermodynamic cycle of heat engine. Under this cycle heat energy is converted into mechanical energy while undergoing phase change. The heat is supplied externally to the closed loop which usually uses water as working fluid.	Understand	CO 2	CLO 04	AME551.04
11	Which of the following material is not used in the boiler furnace walls?	Fire clay, Silica and Kaolin have property of resisting change in shape, weight or physical property at higher temperature. Concrete have no such properties at higher temperature so it is not suitable for that. The construction of boiler furnace varies from plain refractory walls to completely water cooled walls depending upon the characteristics of fuel used and firing methods.	Remember	CO 2	CLO 05	AME551.05
12	Which part of thermal power plant causes maximum energy losses?	About 54% of energy losses occurs in condenser. Losses in boiler and alternator are about 1% and 16% because of such high losses overall efficiency of thermal power plant reduces to	Remember	CO 2	CLO 05	AME551.05

		29% for normal old thermal power plant and 50% for modern super critical pressure steam power plant which employs many heat saving devices.				
13	What is the effect of increasing steam temperature of thermal power plant on its thermal efficiency?	Thermal efficiency of steam power plant increases with increase in steam temperature linearly. Increas in temperature of steam also causes its effect on cost. So temperature of steam is increased only upto a level at which it is economical.	Understand	CO 2	CLO 05	AME551.05
14	Economisers are necessary to use for pressure of 70 kg/cm2?	High cost of fuel consumption, high load factor and high pressure and temperature conditions, all justify the use of economiser. Installation of economiser involves extra cost of installation, maintenance and regular cleaning and additional requirement of space. By considering above points it has been found that use of economiser becomes necessary for pressure above 70 kg/cm2.	Remember	CO 2	CLO 04	AME551.04
15	What is the primary objective of steam power plant?	The primary objective of steam power plant is to produce electricity and then serving as base load plant to hydel or nuclear power plant comes as second priority. Steam power plants produce 86% of electricity. And the efficiency of steam power plant is typically 33%-48%.	Remember	CO 2	CLO 05	AME551.05
16	A steam power plant works on which cycle.	Rankine cycle is a thermodynamic cycle of constant pressure engine that is to convert heat energy into mechanical work and from that following parts like adjoined blades and shafts are made to run to produce electricity. Otto cycle is used in automobile engine and Brayton cycle is used in heat engines & air jet engine.	Understand	CO 2	CLO 05	AME551.05
17	The quality of wet steam can also be measured by an electric calorimeter.	In this the sample of steam is passed in steady flow through an electric heater	Remember	CO 2	CLO 05	AME551.05
18	What is humid specific heat?	It is the specific heat of the mixture of dry air & water vapour.	Remember	CO 2	CLO 04	AME551.04

19	Define dew Pt. temperature ?	It is defined as the temperature at which atmospheric water vapour starts to condense.	Understand	CO 2	CLO 05	AME551.05
20	List out different types of boilers	cochran, lancashire, babcock, and Wilcox boiler	Understand	CO 2	CLO 05	AME551.05
	UNIT-III INTERNAL COMBSUTION ENGINES, REFRIGERATION AND AIR-CONDITIONING					
1	What is refrigeration	Refrigeration may be defined as the process of achieving and maintaining a temperature below that of the surroundings, the aim being to cool some product or space to the required temperature	Remember	CO 3	CLO 07	AME551.07
2	Refrigeration efficiency defines with?	Refrigeration efficiency denoted with COP, coefficient of performance.	Understand	CO 3	CLO 08	AME551.08
3			Remember	CO 3	CLO 07	AME551.07
4	Explain principle of air cycle refrigeration	Air cycle refrigeration works on the principle of reverse Brayton or Joule cycle	Understand	CO 3	CLO 08	AME551.08
5	Explain TOR (ton of refrigeration	The amount of heat removed from 2000kg water at 0˚C to convert into ice at 0˚C in 24 hours.	Remember	CO 3	CLO 08	AME551.08
6	Define Stroke in IC engines	Movement distance of the piston from one extreme position to the other: TDC to BDC or BDC to TDC.	Remember	CO 3	CLO 09	AME551.09
7	Define Combustion chamber	The end of the cylinder between the head and the piston face where combustion occurs. The size of the combustion chamber continuously changes from a minimum volume when the piston is at TDC to a maximum when the piston is at BDC. The term cylinder is sometimes synonymous with combustion chamber	Understand	CO 3	CLO 08	AME551.08
8	Define Cooling fins	Metal fins on the outside surfaces of cylinders and head of an air cooled engine. These extended surfaces cool the cylinders by conduction and convection.	Remember	CO 3	CLO 08	AME551.08
9	What are Valves	Valves are mainly used in 4 stroke reciprocating diesel/petrol engines. Valves need a cam and rocker arm mechanism for opening and closing of valves	Remember	CO 3	CLO 09	AME551.09
10	What is meant by Ports	Port is the best and simplest one to suck the air or air-fuel mixture to	Understand	CO 3	CLO 08	AME551.08

		cylinder and kick the exhaust out. Ports are used in two stroke reciprocating petrol engines and also in rotary engines.				
11	What is 4 stroke IC engine?	A four-stroke cycle engine is an internal combustion engine that utilizes four distinct piston strokes (intake, compression, power, and exhaust) to complete one operating cycle. The piston makes two complete passes in the cylinder to complete one operating cycle	Remember	CO 3	CLO 08	AME551.08
12	What does a refrigerant do?	Refrigerant is required for the proper functioning of a refrigerator.	Remember	CO 3	CLO 09	AME551.09
13	Coefficient of performance(COP) is defined as	Coefficient of performance is the performance parameter used in a refrigerator cycle.	Remember	CO 3	CLO 09	AME551.09
14	The thermal efficiency of theoretical Otto cycle	Does not depends upon the pressure ratio	Understand	CO 3	CLO 09	AME551.09
15	The mean effective pressure of an Otto Cycle increases with an increase in	The mean effective pressure of an Otto Cycle is directly proportional to its compression ratio, so it increases with an increase in compression ratio.	Remember	CO 3	CLO 09	AME551.09
16	What is an Diesel cycle	Diesel cycle is also known as constant pressure cycle as pressure is constant in this cycle.	Remember	CO 3	CLO 09	AME551.09
17	Define internal combustion engine ?	The internal combustion engine (IC) is a heat engine that converts chemical energy in a fuel into mechanical energy, usually made available on a rotating output shaft. Chemical energy of the fuel is first converted to thermal energy by means of combustion or oxidation with air inside the engine	Understand	CO 3	CLO 09	AME551.09
18	Define Fuel injector ?	A pressurized nozzle that sprays fuel into the incoming air on SI engines or into the cylinder on CI engines. On SI engines, fuel injectors are located at the intake valve ports on multipoint port injector systems and upstream at the intake manifold inlet on throttle body injector systems. In a few SI engines, injectors spray directly into the combustion chamber	Remember	CO 3	CLO 08	AME551.08
19	Define Carburetor?	Carburetor is device to prepare the air fuel mixture in right proportion and supply at right time.	Remember	CO 3	CLO 08	AME551.08

20	Define Otto cycle	Otto cycle is a is a combination of 4 thermodynamic processes used as a basis of all the spark ignition engines. It consists of a constant volume heat addition process along with suction, exhaust and heat removal processes.	Understand	CO 3	CLO 09	AME551.09
21	What is 2- stroke IC engine?	A two-stroke (or two-cycle) engine is a type of internal combustion engine which completes a power cycle with two strokes (up and down movements) of the piston during only one crankshaft revolution.	Understand	CO 3	CLO 09	AME551.09
UNIT-IV MACHINE TOOLS AND AUTOMATION						
1	What Metal Cutting ?	Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips.	Remember	CO 4	CLO 10	AME551.10
2	What are the important characteristics of materials used for cutting tools	High red hardness, High wear resistance, Low frictional co-efficient, High toughness, High thermal conductivity	Understand	CO 4	CLO 10	AME551.10
3	What are the different types of lathe machines?	The four main types of lathes are Speed Lathes, Engine Lathes, Tool Room Lathes and Turret Lathes.	Remember	CO 4	CLO 10	AME551.10
4	What are the different types on Lathe operations	The engine lathe is an accurate and versatile machine on which many operations can be performed. These operations are: Plain Turning, Step Turning, Facing Parting, Drilling, Reaming, Boring Knurling, Grooving, Threading Forming	Remember	CO 4	CLO 10	AME551.10
5	What is the difference between tapping and drilling?	Drilling and tapping are two distinct actions. Drilling refers to creating a smooth hole in a material with a drill and motor. Tapping is the action that creates a thread into the side of the hole.	Understand	CO 4	CLO 10	AME551.10
6	What is Lathe machine application?	Applications of Lathe Machine are as follows: Metalworking, Wood turning, Acrylic Spinning, Metal Spinning, Thermal Spraying Pottery	Remember	CO 4	CLO 11	AME551.11
7	What are the parts of a lathe machine?	Bed, Tool post, Chuck, Head stock. Tell stock, Lead screw, Legs. Carriage.	Remember	CO 4	CLO 10	AME551.10
8	Define the term Robot.	“A programmable multifunctional manipulator designed to move material, parts, or specialized devices through variable programmed motions for the performance of a variety of tasks.”	Understand	CO 4	CLO 10	AME551.10

9	What is world coordinate system	World coordinate system is a coordinate system whose origin is specified by a user. This system enables multiple robots to use a common coordinate system for position designation. By setting the origin of the facilities to that of the world coordinate system, you can set positions of different robots on the same coordinate system.	Remember	CO 4	CLO 11	AME551.11
10	What are geometric constraints?	Geometric constraints are the constraints that can be expressed solely in terms of the robot joint angles, these include bounds on the joint angles, avoidance of self-collision and of collision with obstacles, etc. These constraints can thus be fully taken into account in the path planning step	Remember	CO 4	CLO 11	AME551.11
11	Define NC system?	NC is defined as a form of programmable automation in which the process is controlled by alphanumeric data.	Understand	CO 4	CLO 11	AME551.11
12	What are the limitations of using NC	Relatively high price. More complicated maintenance, a special crew is desirable. Highly skilled and properly trained programmers are needed.	Remember	CO 4	CLO 10	AME551.10
13	Define CNC?	CNC is defined as a NC system that utilizes a dedicated, stored computer program to perform some or the entire basic NC functions.	Remember	CO 4	CLO 12	AME551.12
14	Write the main functions of CNC?	Machine tool control, In-process compensation, Improved programming and operating features, Diagnostics.	Understand	CO 4	CLO 11	AME551.11
15	List out the types of CNC machine?	CNC machine can be classified as: Machining centers, Lathe machines, Drilling machine Turning centers, Milling machines, Gear shaping, CNC gear hobbling	Remember	CO 4	CLO 10	AME551.10
16	Define Automation.	Automation is the technology by which a process or procedure is accomplished without human assistance.	Understand	CO 4	CLO 11	AME551.11
17	Define Fixed Automation.	Fixed automation is a system in which the sequence of processing (or assembly) operations is fixed by the equipment configuration. Each of the operations in the sequence is usually simple, involving perhaps a plain linear or rotational motion or an uncomplicated combination of the two.	Remember	CO 4	CLO 12	AME551.12

18	Explain Programmable Automation.	In programmable automation the production equipment is designed with the capability to change the sequence of operations to accommodate different product configuration. The operation sequence is controlled by a program, which is a set of instructions coded so that they can be read and interpreted by the system.	Remember	CO 4	CLO 12	AME551.12
19	Define Flexible Automation.	Flexible automation is an extension of programmable automation. A flexible automated system is capable of producing a variety of parts (or products) with virtually no time lost for changeovers from one part style to the next. There is no lost production time while reprogramming the system and altering the physical setup (tooting, fixtures, machine settings).	Understand	CO 4	CLO 12	AME551.12
20	Define Articulated Robot.	An Articulated robot can be defined as a robot with rotary joint and these robots can range from simple two-jointed structures to systems with 10 or more interacting joints.	Remember	CO 4	CLO 12	AME551.12
UNIT-V ENGINEERING MATERIALS, JOINING PROCESS						
1	The continuous phase of a composite material is known as its	Composite materials contain mostly two phases: matrix and dispersed phase. Matrix phase is a continuous phase which tends to bind the fibers together. It also protects them from damage and is used to transmit the load.	Remember	CO 5	CLO 13	AME551.13
2	What are materials are commonly used for whiskers?	Whiskers are single crystals having large ratios of length to diameter. The common materials are graphite, silicon nitride, aluminum oxide etc. Glass and boron fall under the category of polymers of fibers. Steel, tungsten, and molybdenum are commonly used as wires.	Understand	CO 5	CLO 13	AME551.13
3	What is the purpose of fiberglass that is made as a thread?	Fiberglass is either made into a staple or thread. The thread type is used to make cloth for various applications. It is also colored and can be manufactured by a continuous process. Staple type (up to 15 inches long), on the other hand, is used as an insulating material.	Remember	CO 5	CLO 13	AME551.13
4	In sandwich composites, which of the following material can be used for filling	Wood, cement, and polymer can be used to fill the gap in sandwich composites.	Remember	CO 5	CLO 13	AME551.13

	purpose?					
5	Which of the following property can be enhanced by reinforcing aluminum alloy?	Wear resistance increases by reinforcing aluminum alloy due to good wear resistance property of aluminum..	Understand	CO 5	CLO 13	AME551.13
6	How Pig iron can be easily obtained by processing of iron ore .	Iron from its ore is converted to pig iron in a blast furnace. Ore iron is the purest form but it can not be used in this form.	Remember	CO 5	CLO 13	AME551.13
7	How steel can be easily obtained.	Iron from its pig iron form is converted to steel in Bessemer converter.As pig iron is very weak in strength hence it can not be used for practical purpose.	Remember	CO 5	CLO 14	AME551.14
8	How Abrasion resistance of an alloy steel can be improved using	Titanium has very high abrasive resistance property. Titanium is used to improve abrasive resistance of base metal in an alloy.	Understand	CO 5	CLO 14	AME551.14
9	How Corrosion resistance of an alloy steel can be improved by?	Chromium has very high corrosion and oxidation resistance property. Chromium is alloyed with base metal to increase its corrosion resistance.	Remember	CO 5	CLO 14	AME551.14
10	How Tensile strength of an alloy steel can be improved	Nickel can improve tensile strength as well as toughness of alloy steel. It is alloyed with base metal in small quantity.	Remember	CO 5	CLO 14	AME551.14
11	Which of the following induces fine grain distribution in alloy steel?	Vanadium induces fine grain distribution in alloy steel. It helps in improving uniformity in the base metal.	Understand	CO 5	CLO 14	AME551.14
12	What is the Alloy of copper and zinc is known?	Brass contains 50% copper and 50% zinc. Brass is the alloy of copper and zinc. It has good property of corrosion resistance.	Remember	CO 5	CLO 14	AME551.14
13	What is the Alloy of Ni and Fe is known as	Invar contains 36% nickel and 64% iron. Invar is the alloy of Nickel and iron. It has the property of good hardness.	Remember	CO 5	CLO 14	AME551.14
14	What is Major constituent of the gun metal alloy.	Gun metal contains 83% copper and 2% zinc and 10% tin. Gun metal is alloy of copper, zinc and tin, where copper is the base metal.	Understand	CO 5	CLO 15	AME551.15
15	Which of the alloy is widely used in thermo couples?	Nichrome contains 80% nickel and 20% chromium and used in thermo couples and strain gauges. Nichrome is a good resistance material to electricity.	Understand	CO 5	CLO 15	AME551.15
16	Matrix constituents of composites are softer and reinforced constituent of composites are softer.	matrix constituents are generally softer whereas reinforced constituents provide hardness to the composites.	Remember	CO 5	CLO 15	AME551.15
17	Which of the property can be enhanced by	Wear resistance increases by reinforcing aluminum alloy due to	Understand	CO 5	CLO 15	AME551.15

	reinforcing aluminum alloy?	good wear resistance property of aluminum.				
18	Which of property of matrix materials which are modified by adding particulate fillers?	Improved performance at elevated temperature, decrease in surface hardness, modification in electrical conductivity, improved abrasion resistance are some of the properties of matrix materials which are modified by adding particulate fillers.	Remember	CO 5	CLO 15	AME551.15
19	Define the most popular types of core material used.	One of the most popular types of core material used is a honeycomb structure. Rest all options are not used widely as core material should be light-weight and high corrosion resistance.	Remember	CO 5	CLO 15	AME551.15
20	List the application of a sandwich panel?	Fabrication of wings of aircrafts, design of ships, boat hulls and fabrication of roofs, floors and walls of buildings are some of the applications of sandwich panel. Conveyor belts are not the application of sandwich panel.	Understand	CO 5	CLO 15	AME551.15

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