INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**DESIGN OF HYDRAULIC AND PNUEMATIC SYSTEMS**
Course Code	:	**AME519**
Program	:	**B.Tech**
Semester	:	**V**
Branch	:	**MechanicalEngineering**
Section	:	**A& B**
Academic Year	:	**2019- 2020**
Course Faculty	:	**Mr. G Musalaiah, Assistant Professor**

COURSE OBJECTIVES:

The course should enable the students to:	
I	Understand of basic knowledge of hydraulic and pneumatic systems.
II	Classification of pumps based on the working phenomenon.
III	Use of hydraulic power pack in the hydraulic systems.
IV	Design of hydraulic circuits based on the application.

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	What is Pascal's law in simple terms?	Pascal's law basically states that any pressure applied to a fluid inside a closed system will transmit that pressure equally in all directions throughout the fluid. This law is the basic principle that causes hydraulic power in heavy construction machines to work	Understand	CO 1	CLO 1	AME519.01
2	What is Brahma press?	A hydraulic press is a machine press using a hydraulic cylinder to generate a compressive force. It uses the hydraulic equivalent of a mechanical lever, and was also known as a Bramah press after the inventor, Joseph Bramah, of England. He invented and was issued a patent on this press in 1795.	Remember	CO 1	CLO 1	AME519.01
3	What is Bernoulli's	Bernoulli's principle, this is the idea that where the speed of a	Remember	CO 1	CLO 1	AME519.01

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	principle used for?	fluid increases, the pressure in the fluid decreases. A fluid's speed will increase as it travels through narrower spaces and decrease as it travels through wider spaces. Bernoulli's principle can be applied to many everyday situations.				
4	What are the properties of a liquid?	Liquids take on the shape of their container. The liquid state of matter is an intermediate phase between solid and gas. Like the particles of a solid, particles in a liquid are subject to intermolecular attraction however, liquid particles have more space between them, so they are not fixed in position.	Remember	CO 1	CLO 1	AME519.01
5	What is called viscosity?	Viscosity, resistance of a fluid (liquid or gas) to a change in shape, or movement of neighboring portions relative to one another. Viscosity denotes opposition to flow.	Remember	CO 1	CLO 1	AME519.01
6	What is a HPU unit?	Hydraulic Power Units are the main driving components of hydraulic systems. Consisting mainly of a motor, a reservoir and a hydraulic pump, these units can generate a tremendous amount of power to drive most any kind of hydraulic ram.	Remember	CO 1	CLO 2	AME519.02
7	What is a fluid?	A substance that will deform continuously in response to a shear stress no matter how small the stress .	Remember	CO 1	CLO 2	AME519.02
8	How many types of hydraulic oil are there?	Main hydraulic oil is broadly classified into following 3 types. Hydraulic oil specially used in general hydraulic machines. Antifriction characteristics, shear stability of viscosity, oxidation stability etc. suitable for hydraulic machines.	Remember	CO 1	CLO 2	AME519.02
9	What are the properties of hydraulic oil?	Optimal properties of hydraulic oils are achieved by a combination of a base oil and additives (anti-wear additives, detergents, Anti-oxidants, anti-foaming agents, Corrosion inhibitors etc.). Mineral based oils are the most common and low cost hydraulic fluids.	Remember	CO 1	CLO 2	AME519.02
10	What is automation system?	Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens,	Remember	CO 1	CLO 2	AME519.02

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		switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human.				
11	what is hydraulic fluid?	A hydraulic fluid or hydraulic liquid is the medium by which power is transferred in hydraulic machinery. Common hydraulic fluids are based on mineral oil or water.	Remember	CO 1	CLO 3	AME519.03
12	What are the characteristics of fluid?	Fluids have common properties that they share, such as density, pressure, buoyancy compressibility and viscosity. However, just because fluids share similar characteristics doesn't mean the specifics of those characteristics are the same for each material.	Remember	CO 1	CLO 3	AME519.03
13	What are the properties of viscosity?	Viscosity is another type of bulk property defined as a liquid's resistance to flow. When the intermolecular forces of attraction are strong within a liquid, there is a larger viscosity. An example of this phenomenon is imagining a race between two liquids down a windshield.	Understand	CO 1	CLO 3	AME519.03
14	What are the flow properties?	Cohesive strength: powder flow ability through hoppers. Wall friction: hopper angles to achieve mass flow.	Remember	CO 1	CLO 3	AME519.03
15	What do all liquids have in common?	A fluid is a subset of the states of matter, consisting of liquids, gases and plasmas. They have common properties that are distinct from solids. Fluids do not have a specific shape as do solids. Instead, fluids take the shape of their containers.	Remember	CO 1	CLO 3	AME519.03
UNIT-II						
1	What is pump and its classification?	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.	Remember	CO 2	CLO 4	AME519.04
2	What is pump system?	Many kinds of pumps are used distribution systems. Pumps that lift surface water and move it to a nearby treatment plant are called low-lift pumps.The flow	Remember	CO 2	CLO 4	AME519.04

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		rate through a centrifugal pump depends on the pressure against which it operates.				
3	How does a gravity pump work?	A gravity pump, also known as a water ram pump works by using the potential energy of water at a higher level than the pump. The water flows down a pipe to the pump, and its kinetic energy is used to pump a fraction of that water volume to a height that can be several times the height of the original water source.	Understand	CO 2	CLO 4	AME519.04
4	What are the different types of gear pump?	A typical housing will have an inlet and outlet, for suction and discharge respectively. There are two main types: external gear pumps (Exterior-bearing type) which use two external gears (Figure 1, below) and internal gear pumps (Internal-bearing type) which use internal and external gears.	Understand	CO 2	CLO 4	AME519.04
5	What is the purpose of gear pump?	A gear pump uses the meshing of gears to pump fluid by displacement. They are one of the most common types of pumps for hydraulic fluid power applications. The gear pump was invented around 1600 by Johannes Kepler. Gear pumps are also widely used in chemical installations to pump high viscosity fluids.	Understand	CO 2	CLO 4	AME519.04
6	Why gear pump is called positive displacement pump?	A Positive Displacement Pump operating against closed discharge valves continues to produce flow until the pressure in the discharge line is increased until the line bursts or the pump is severely damaged - or both. An internal valve should in general only be used as a safety precaution.	Remember	CO 2	CLO 5	AME519.05
7	What is priming of pump?	Pump priming is the action taken to stimulate an economy, usually during a recessionary period, through government spending and interest rate and tax reductions. The term pump priming is derived from the operation of older pumps - a suction valve had to be primed with water so that the pump would function properly.	Remember	CO 2	CLO 5	AME519.05

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8	What are screw pumps used for?	A screw pump is a type of positive displacement pump that uses two or more screws that intermesh to pressurize fluids and move them in a system. The screws take in fluid then push it out from the other side while increasing its pressure	Remember	CO 2	CLO 5	AME519.05
9	How does a vane pump work?	Vanes or blades fit within the slots of the impeller. As the rotor rotates (yellow arrow) and fluid enters the pump, centrifugal force, hydraulic pressure, and/or pushrods push the vanes to the walls of the housing. ... Fluid enters the pockets created by the vanes, rotor, cam, and side plate.	Remember	CO 2	CLO 5	AME519.05
10	What are the two types of vane pumps?	There are two types of vane pumps: 1. Unbalanced vane pump: Unbalanced vane pumps are of two varieties: Unbalanced vane pump with fixed delivery.	Remember	CO 2	CLO 5	AME519.05
11	What is inline piston pump?	An axial piston pump is a positive displacement pump that has a number of pistons in a circular array within a cylinder block. It can be used as a stand-alone pump, a hydraulic motor or an automotive air conditioning compressor.	Remember	CO 2	CLO 6	AME519.06
12	What is external gear pump?	External gear pumps are a popular pumping principle and are often used as lubrication pumps in machine tools, in fluid power transfer units, and as oil pumps in engines. External gear pumps can come in single or double (two sets of gears)pump configurations with spur (shown), helical, and herringbone gears.	Remember	CO 2	CLO 6	AME519.06
13	What is an internal gear pump?	Internal gear pumps are exceptionally versatile. While they are often used on thin liquids such as solvents and fuel oil, they excel at efficiently pumping thick liquids such as asphalt, chocolate, and adhesives.	Remember	CO 2	CLO 6	AME519.06
14	What is input and output power?	The electrical energy supplied to it by the circuit per unit time is the input power, and it drives other mechanical work to provide power for the output power of the motor.	Remember	CO 2	CLO 6	AME519.06
15	What do you mean by	An actuator is a device that moves or controls some	Remember	CO 2	CLO 6	AME519.06

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	actuator?	mechanism. An actuator turns a control signal into mechanical action such as an electric motor. Actuators may be based on hydraulic, pneumatic, electric, thermal or mechanical means, but are increasingly being driven by software.				
UNIT-III						
1	What is a hydraulic power pack?	In basic terms, a hydraulic power pack is a self-contained unit that consists mainly of a motor, a reservoir and a hydraulic pump. Using fluid to transmit power from one location to another, hydraulic power packs can generate massive amounts of power which can be used to drive hydraulic machinery.	Understand	CO 3	CLO 7	AME519.07
2	How is hydraulic power generated?	A hydraulic power network is a system of interconnected pipes carrying pressurized liquid used to transmit mechanical power from a power source, like a pump to hydraulic equipment like lifts or motors. The system is analogous to an electrical grid transmitting power from a generating station to end-users.	Remember	CO 3	CLO 7	AME519.07
3	what is line pressure?	The line pressure specification is the maximum pressure that can be applied to both ports at the same time. The maximum line pressure for the P55D, for example, is 3200 psig, and this is the maximum pressure that can be applied to both ports simultaneously.	Remember	CO 3	CLO 7	AME519.07
4	What does stream discharge mean?	Stream Discharge Estimate. A stream discharge estimate is a measurement of how much water flows through a stream in one second. ... The depth and swiftness of a stream affect the communities of macroinvertebrates and other organisms that are able to live in the stream.	Remember	CO 3	CLO 8	AME519.08
5	What is the difference between hydraulic pump and hydraulic motor?	A hydraulic pump is a device which converts mechanical force and motion into fluid power. A hydraulic motor is not a hydraulic pump when run backward. Differences between a hydraulic motor and	Remember	CO 3	CLO 8	AME519.08

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		a hydraulic pump are given below. Hydraulic Motor : It is a device for delivering torque at a given pressure.				
6	How does a hydraulic motor works?	Hydraulic motors are rotary actuators that convert hydraulic, or fluid energy into mechanical power. They work in tandem with a hydraulic pump, which converts mechanical power into fluid, or hydraulic power.Fixed-displacement motors drive a load at a constant speed while a constant input flow is provided.	Understand	CO 3	CLO 8	AME519.08
7	What is hydraulic motor displacement?	Rugged hydraulic motors transform fluid energy into rotary mechanical power, which typically is applied to a load via shaft. Displacement of hydraulic motors may be fixed or variable. A fixed-displacement motor provides constant torque. Speed is varied by controlling the amount of input flow into the motor.	Remember	CO 3	CLO 8	AME519.08
8	What is a motor spool?	A spool designed to provide flow from “work” ports to “tank” when spool is in neutral position. This allows a motor to coast to a stop after the spool is placed in neutral position.	Understand	CO 3	CLO 8	AME519.08
9	How does hydraulic power unit work?	When a hydraulic power unit begins functioning, the gear pump pulls hydraulic fluid out of the tank and moves it into an accumulator. This process continues until the pressure within the accumulator reaches a predetermined level, at which point a charging valve switches the pumping action to begin circulating fluid.	Remember	CO 3	CLO 9	AME519.09
10	Standard Hydraul ic Power Pack Units	Such hydraulic power packs create huge power and high flow rates. They can handle heavy loads for a long period of time. Their tank capacity is about 180 liters with a flow rate of about 100 liters/minute.	Remember	CO 3	CLO 9	AME519.09
11	What is hydraulic power of pump?	A hydraulic pump is a mechanical source of power that converts mechanical power into hydraulic energy (hydrostatic energy i.e. flow, pressure). It generates flow with enough power to overcome pressure induced by the load at the pump outlet.	Remember	CO 3	CLO 9	AME519.09

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12	what is pressure relief valve?	A relief valve or pressure relief valve (PRV) is a type of safety valve used to control or limit the pressure in a system; pressure might otherwise build up and create a process upset, instrument or equipment failure, or fire	Remember	CO 3	CLO 10	AME519.010
13	How does a pressure control valve work?	Pressure-control valves are found in virtually every hydraulic system, and they assist in a variety of functions, from keeping system pressures safely below a desired upper limit to maintaining a set pressure in part of a circuit. Types include relief, reducing, sequence, counterbalance, and unloading.	Remember	CO 3	CLO 10	AME519.010
14	What is a heating and cooling system?	During warm seasons your heating system works with your central air conditioning. Air is cooled as it's blown over your air conditioning unit's cooling coil, often attached to the air circulating fan of the furnace, and then sent through the same air ducts throughout your home.	Remember	CO 3	CLO 10	AME519.010
15	How does temperature affect hydraulic oil?	Low-Temperature Effects. Low temperature can damage the temperature stability of a hydraulic fluid or lubricant just as much as high temperature. ... For hydraulic circulating systems, high oil viscosity causes a drastic drop in the oil's static pressure as suction draws the oil into the pump's inlet.	Remember	CO 3	CLO 10	AME519.010
UNIT-IV						
1	What is a basic hydraulic system?	The basis for all hydraulic systems is expressed by Pascal's law which states that the pressure exerted anywhere upon an enclosed liquid is transmitted undiminished, in all directions, to the interior of the container.	Remember	CO 4	CLO 11	AME519.011
2	What is Hydraulic circuits?	A hydraulic circuit is a system comprising an interconnected set of discrete components that transport liquid. The purpose of this system may be to control where fluid flows (as in a network of tubes of coolant in a thermodynamic system) or to	Remember	CO 4	CLO 11	AME519.011

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		control fluid pressure (as in hydraulic amplifiers).				
3	what is Hydaulic accumulator?	A hydraulic accumulator is a pressure storage reservoir in which a non-compressible hydraulic fluid is held under pressure that is applied by an external source. The external source can be a spring, a raised weight, or a compressed gas.	Remember	CO 4	CLO 11	AME519.011
4	What is the function of hydraulic accumulator?	The external source can be a spring, a raised weight, or a compressed gas. An accumulator enables a hydraulic system to cope with extremes of demand using a less powerful pump, to respond more quickly to a temporary demand, and to smooth out pulsations. It is a type of energy storage device.	Remember	CO 4	CLO 11	AME519.011
5	What kind of energy is stored in an accumulator?	In electricity, electrical energy is stored to the battery. On the other hand, in the hydraulic field, fluid energy (pressure of the fluid) is stored in an accumulator and is discharged when required.	Remember	CO 4	CLO 12	AME519.012
6	What is the main function of the accumulator?	An accumulator is a register for short-term, intermediate storage of arithmetic and logic data in a computer's CPU (central processing unit).	Remember	CO 4	CLO 12	AME519.012
7	what is the manual hydraulic system?	The fluid used in a hydraulic system is an incompressible liquid such as a mineral based hydraulic oil. Pressure is applied by a piston to fluid in a cylinder, causing the fluid to press on another piston that delivers energy to a load. Reversed instantly while in full motion without damage.	Remember	CO 4	CLO 12	AME519.012
8	what is the automatic hydraulic system?	Automatic transmissions have a neat pump, called a gear pump. It draws fluid from a sump in the bottom of the transmission and feeds it to the hydraulic system. It also feeds the transmission cooler and the torque converter.	Remember	CO 4	CLO 12	AME519.012
9	What is hydraulic automatic control system?	A hydraulic control system for an automatic transmission. The hydraulic control system is applied to an automatic transmission adapted to vary a torque capacity of a transmission member by an actuator.	Remember	CO 4	CLO 13	AME519.013

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10	what is regenerative circuit?	The regenerative circuit is used to increase the out-stroke speed of piston of a double - acting cylinder. In this circuit, the fluid from the rod end of the cylinder regenerates with the pump flow.	Remember	CO 4	CLO 13	AME519.013
11	what is check valves in hydraulic circuit?	A check valve is the simplest type of directional control valve used in hydraulic systems. Check valves stop the flow of fluid in one direction and allow free flow in the opposite direction. They are also known as non-return valves.	Remember	CO 4	CLO 13	AME519.013
12	What is difference between NRV and check valve?	A check valve is a specific type of valve which can prevent backflow from occurring. It has to be tested and meet very strict criteria, which ensures fluids are not able to be siphoned back into drinking water systems.	Remember	CO 4	CLO 13	AME519.013
13	What are the criteria for pump selection?	Factors to be considered for pump selection are as follow: Process Liquid Properties: liquid properties that must be considered before selecting a pump are: liquidviscosity, Temperature, specific gravity, vapor pressure etc.	Remember	CO 4	CLO 14	AME519.014
14	What is the capacity of the pump?	Pump capacity is a term used to describe the maximum flow rate through a pump at its designed conditions. It is a measurement usually given in gallons per minute (gpm) or cubic meters per hour (m3/h).	Remember	CO 4	CLO 14	AME519.014
15	What is solenoid valve and how it works?	The magnetic field exerts a force on the plunger. As a result, the plunger is pulled toward the center of the coil so that the orifice opens. This is the basic principle that is used to open and close solenoid valves. "A solenoid valve is an electromechanical actuated valve to control the flow of liquids and gases."	Remember	CO 4	CLO 14	AME519.014
UNIT-V						
1	What is automation ?	To many people, automation means manufacturing automation. Exa mples of fixed automation include machining transfer lines found in the automotive industry, automatic assembly machines, and certain chemical processes.	Remember	CO 5	CLO 15	AME519.015

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
2	What is hydraulic automation?	Hydraulic Automation. Hydraulic systems that offer power and control together are used in various industries in various areas.	Remember	CO 5	CLO 15	AME519.015
3	What is hydraulic control?	A hydraulic system controls the transmission of energy. It transforms the mechanical energy of a prime motor into fluid energy. Thus, they have been widely used as the energy transmission control systems in aircraft, ships, construction machinery, machine tools and others.	Remember	CO 5	CLO 15	AME519.015
4	what is low cost automation?	It is a technology that creates some degree of automation around the existing equipment, tool, methods, and people, using mostly standard components available in the market.	Remember	CO 5	CLO 15	AME519.015
5	what is relay circuit?	Relays are switches that open and close circuit selector-mechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized.	Understand	CO 5	CLO 16	AME519.016
6	What is the basic of PLC?	Basic PLC operation. The basic elements of a PLC include input modules or points, a Central Processing Unit (CPU), output modules or points, and a programming device.	Understand	CO 5	CLO 16	AME519.016
7	How PLC is used in automation?	A PLC is a Programmable Logic Controller. In other words, it is an industrial computer used as a standalone unit and can be used in a network of PLCs to automatically control a process or perform a specific function. Future of industrialautomation would be great if automation people use PLC to control processes.	Understand	CO 5	CLO 16	AME519.016
8	What is HMI programming?	Most modern control systems employ a PLC (Programmable Logic Controller) as a means to control motors, pumps, valves and various other equipment used in a process.Computer based HMI (Human Machine. Interface) products provide the means by which process	Understand	CO 5	CLO 16	AME519.016

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		personnel interact with the PLC control system.				
9	How does a micro controller work?	Microcontrollers are embedded inside devices to control the actions and features of a product. Hence, they can also be referred to as embedded controllers. They run one specific program and are dedicated to a single task. They are low power devices with dedicated input devices and small LED or LCD display outputs.	Understand	CO 5	CLO 16	AME519.016
10	What is the difference between microprocessor and micro controller?	Microprocessor is an IC which has only the CPU inside them i.e. only the processing powers such as Intel's Pentium 1,2,3,4, core 2 duo, i3, i5 etc.Microcontroller has a CPU, in addition with a fixed amount of RAM, ROM and other peripherals all embedded on a single chip.	Understand	CO 5	CLO 17	AME519.017
11	Which fluid is used in hydraulic power systems?	Power steering fluid is a sub type of hydraulic fluid. Most are mineral oil or silicone based fluids, while some use automatic transmission fluid, made from synthetic base oil.	Remember	CO 5	CLO 17	AME519.017
12	How does a pneumatic circuit work?	In a pneumatic system, energy that will be used by the system and transmitted through the system is stored as potential energy in an air receiver tank in the form of compressed air. A pressure regulator is positioned after a receiver tank and is used to portion out this stored energy to each leg of the circuit.	Remember	CO 5	CLO 17	AME519.017
13	Do air cylinders need lubrication?	The pneumatic cylinders, which often need their own source of lubrication, inspect and service your lubrication system, as needed. A basic system will have a lubricator built into the filter/regulator assembly, which is fairly reliable. However, no lube oil can be provided when the reservoir is empty.	Remember	CO 5	CLO 18	AME519.018
14	What does a lubricator do?	A pneumatic lubricator injects an aerosolized stream of oil into an airline to provide lubrication to the internal working parts of pneumatic tools, and to other devices such as actuating cylinders, valves and motors. A lubricator should always be the last element in an FRL (Filter-Regulator-Lubricator)	Remember	CO 5	CLO 18	AME519.018

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		unit.				
15	What is mechanical cylinder?	Piston and cylinder, in mechanical engineering, sliding cylinder with a closed head (the piston) that is moved reciprocally in a slightly larger cylindrical chamber (the cylinder) by or against pressure of a fluid, as in an engine or pump.	Remember	CO 5	CLO 18	AME519.018

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