INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	**MECHANICS OF FLUIDS AND HYDRAULIC MACHINES**
Course Code	:	**AME008**
Program	:	**B.Tech**
Semester	:	**IV**
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Section	:	**A,B**
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Course Faculty	:	**Mr. A. Somaiah, Assistant Professor, Mech. Engg**

OBJECTIVES

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
UNIT - I					
1	Define viscosity.	A fluid property that relates the magnitude of fluid shear stresses to the fluid strain rate, or more simply, to the spatial rate of change in the fluid velocity field.	Remember	CLO1	CAME008.01
2	What is compressible fluid?	A fluid flow is compressible if its density ρ changes appreciably (typically by a few percent) within the domain of interest.	Remember	CLO1	CAME008.01
3	Define density.	The mass of fluid per unit volume. For a compressible fluid flow, the density can vary from place to place.	Understand	CLO1	CAME008.01
4	What is the expression for Newton's law of viscosity?	$\tau = \mu \frac{\partial v}{\partial y}$ N/mm^2	Remember	CLO1	CAME008.01
4	What is a Newtonian fluid?	A Newtonian fluid is a viscous fluid whose shear stresses are a linear function of the fluid strain rate.	Understand	CLO1	CAME008.01
5	What is barotropic fluid?	A barotropic fluid is one whose pressure and density are related by an equation of state that does not contain the temperature as a dependent variable. Mathematically, the equation of state can be expressed as p = p(ρ) or ρ = ρ (p).	Understand	CLO1	CAME008.01
6	What is a fluid?	A substance that will deform continuously in response to a shear stress no matter how small the stress may be.	Understand	CLO1	CAME008.01
7	What is a Non-Newtonian fluid?	Non-Newtonian fluid viscosity changes with the applied shear force.	Remember	CLO1	CAME008.01
8	Define surface tension.	Surface tension is a force within the surface layer of a liquid that causes the layer to behave as an elastic sheet.	Understand	CLO1	CAME008.01
9	What is a Vapor pressure?	For a particular substance at any given temperature there is a pressure at which the vapor of that substance is in equilibrium with its liquid or solid forms.	Remember	CLO1	CAME008.01
10	What is the expression for surface tension of liquid jet?	$\sigma = \frac{Pd}{4} N/m$	Understand	CLO1	CAME008.01
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	Understand	CLO1	CAME008.01

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		similar characteristics doesn't mean the specifics of those characteristics are the same for each material			
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.	Remember	CLO1	CAME008.01
14	What is the expression for surface tension of hollow bubble?	$\sigma = \frac{Pd}{8} N/m$	Understand	CLO1	CAME008.01
15	What is Rho in fluid mechanics?	Another coefficient, known as the kinematic viscosity (, Greek nu) is defined as the ratio of dynamic viscosity and density. I.e., $\nu = \mu / \rho$.	Understand	CLO1	CAME008.01
16	What is standard fluid?	The relative density of any fluid is defined as the ratio of the density of that fluid to the density of the standard fluid. For liquids we take water as a standard fluid with density ρ=1000 kg/m^3. For gases we take air or O_2 as a standard fluid with density, ρ=1.293 kg/m^3.	Understand	CLO1	CAME008.01
17	What is the expression for surface tension of liquid jet?	$\sigma = \frac{Pd}{2} N/m$	Remember	CLO1	CAME008.01
18	What is the coefficient of viscosity?	The degree to which a fluid resists flow under an applied force, measured by the tangential friction force per unit area divided by the velocity gradient under conditions of streamline flow.	Understand	CLO1	CAME008.01
19	What is absolute pressure?	$P_{abs} = P_{atm} + P_g$. $P_{abs} = P_{atm} - P_{vac.}$	Remember	CLO1	CAME008.01
20	What is SI unit of coefficient of viscosity?	The SI unit of kinematic viscosity is m2/s, whereas the cgs unit for kinematic viscosity is the stokes (St), named after Sir George Gabriel Stokes. It is sometimes expressed in terms of centistokes (cSt). In U.S. usage, stoke is sometimes used as the singular form.	Understand	CLO1	CAME008.01
21	What factors affect viscosity?	Temperature, pressure (at very high value) and concentration are the factors on which viscosity of a fluid depends. By increasing the temperature the viscisity of a fluid decreases fue to increase in molecular motion. Pressure doesn't have very much effect but slightly effect when high pressure is applied.	Remember	CLO1	CAME008.01
22	What is the expression for U-tube manometer gauge pressure?	$P_A = \rho g(h_2S_2 - h_1S_1)$ N/mm^2	Understand	CLO1	CAME008.01

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23	What is the expression for U-tube manometer gauge pressure?	$P_A = -\rho g(h_2S_2+h_1S_1)$ N/mm^2	Remember	CLO1	CAME008.01
24	What is the relationship between kinematic and dynamic viscosity?	$\upsilon = \frac{\mu}{\rho} m^2/s$	Understand	CLO1	CAME008.01
		UNIT – II			
1	What is a streamline?	A path in a steady flow field along which a given fluid particle travels.	Understand	CLO4	CAME008.04
2	What is the expression for steady flow?	$\frac{\partial v}{\partial t} = 0, \frac{\partial p}{\partial t} = 0, \frac{\partial \rho}{\partial t} = 0, \frac{\partial T}{\partial t} = 0$	Remember	CLO4	CAME008.04
3	What is a irrotational flow?	An irrotational fluid flow is one whose streamlines never loop back on themselves. Typically, only inviscid fluids can be irrotational. Of course, a uniform viscid fluid flow without boundaries is also irrotational, but this is a special case.	Understand	CLO4	CAME008.04
4	Define laminar flow.	An organized flow field that can be described with streamlines. In order for laminar flow to be permissible, the viscous stresses must dominate over the fluid inertia stresses.	Remember	CLO4	CAME008.04
5	What are One, Two and Three Dimensional Flows?	Term one, two or three dimensional flow refers to the number of space coordinated required to describe a flow. It appears that any physical flow is generally three-dimensional. But these are difficult to calculate and call for as much simplification as possible. This is achieved by ignoring changes to flow in any of the directions, thus reducing the complexity. It may be possible to reduce a three-dimensional problem to a two-dimensional one, even an one-dimensional one at times.	Understand	CLO4	CAME008.04
6	What is the expression for steady flow?	$\frac{\partial v}{\partial t} \neq 0, \frac{\partial p}{\partial t} \neq 0, \frac{\partial \rho}{\partial t} \neq 0, \frac{\partial T}{\partial t} \neq 0$	Remember	CLO4	CAME008.04
7	Define streakline.	Streakline concentrates on fluid particles that have gone through a fixed station or point. At some instant of time the position of all these particles are marked and a line is drawn through them. Such a line is called a streakline	Remember	CLO5	CAME008.05
8	What are Eularian and Lagrangian approaches?	Eularian and Lagrangian approaches seem to be the two methods to study fluid motion. The Eularian approach concentrates on fluid properties at a	Understand	CLO7	CAME008.07

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		point P (x,y,z,t). Thus it is a field approach. In the Lagrangian approach one identifies a particle or a group of particles and follows them with time. This is bound to be a cumbersome method.			
9	What is the expression for Bernoulli's equation?	$\frac{p}{\rho g}+\frac{v^2}{2g}+z=c$	Remember	CLO7	CAME008.07
10	What is Euler's equation?	In fluid dynamics, the Euler equations are a set of quasilinear hyperbolic equations governing adiabatic and inviscid flow. They are named after Leonhard Euler.	Understand	CLO7	CAME008.07
11	What are the types of flow meters?	Rotameters or Variable Area flow meter. The rotameter is a tapered tube and a float. Spring and piston flow meters, Ultrasonic flow meters, Turbine flow Meters.	Remember	CLO4	CAME008.04
12	What is the expression for Euler's equation?	$\frac{\partial p}{\rho}+g.dz+v.\partial v=0$	Understand	CLO4	CAME008.04
13	What is meant by fluid flow?	Fluid Flow is a part of fluid mechanics and deals with fluid dynamics. Fluids such as gases and liquids in motion is called as fluid flow. Motion of a fluid subjected to unbalanced forces. This motion continues as long as unbalanced forces are applied.	Remember	CLO4	CAME008.04
14	What is flow pattern?	The flow pattern is the way in which fluids move through a reactor. Density gradients, caused by temperature or composition variations, tend to control the overall flow pattern of the fluid.	Remember	CLO5	CAME008.05
15	what is the expression for Cd?	$C_d=\frac{Q_a}{Q_{th}}$	Remember	CLO4	CAME008.04
16	What is a Venturi flow meter?	A practical instrument which makes use of the Bernoulli effect and a manometer pressure gauge is the venturi flowmeter. The illustration shows that you can express the fluid velocity v1 at the inlet of the device in terms of the difference in pressure measured by the manometer.	Remember	CLO5	CAME008.05
17	What is the expression for discharge through a venturimeter?	$Q=\frac{Cd.a_1.a_2.\sqrt{2gh}}{\sqrt{a_1^2-a_2^2}}m^3/s$	Understand	CLO5	CAME008.05
18	How do you calculate Reynolds number?	The Reynolds number (Re) of a flowing fluid is calculated by multiplying the fluid velocity by the internal pipe diameter (to obtain the inertia force of the fluid) and then dividing the result by the kinematic viscosity (viscous force per unit length).	Remember	CLO7	CAME008.07

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19	What is the expression for discharge through a orificemeter?	$Q = \frac{Cd.a_1.a_o.\sqrt{2gh}}{\sqrt{a_1^{\,2} - a_o^{\,2}}} m^3/s$	Remember	CLO4	CAME008.04
20	Why Cd value is high in Venturi meter than orifice meter?	In Venturi meter losses are less so coefficient of discharge is higher whereas in orifice meter due to no convergent and divergent cones there are more losses and hence its coefficient of discharge is less.In venturi meter losses are low due to steamline shape of the diffuser and the pressure gradient is not abrupt.	Remember	CLO5	CAME008.05
21	What is flow nozzle?	A device used to measure the flow rate of fluids in a pipe or conduit. A flow nozzle consists of a cone-shaped passage that creates a partial blockage of the conduit, and flow rate is determined by measuring the fluid pressure before and after the flow nozzle.	Understand	CLO7	CAME008.07
22	What is the expression for Reynolds number?	$\mathrm{Re} = \frac{\rho v d}{\mu}$	Remember	CLO7	CAME008.07
23	What is the range of Reynolds Number?	Actually, the transition between laminar and turbulent flow occurs not at a specific value of the Reynolds number but in a range usually beginning between 1,000 to 2,000 and extending upward to between 3,000 and 5,000.	Understand	CLO7	CAME008.07
24	Define pathline.	The line traced by a given particle. This is generated by injecting a dye into the fluid and following its path by photography or other means	Remember	CLO4	CAME008.04
	What is Bernoulli's principle?	In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. The principle is named after Daniel Bernoulli who published it in his book Hydrodynamica in 1738.	Remember	CLO7	CAME008.07
	What is Reynolds number for laminar flow?	While laminar flow is "orderly" turbulent flow is "Random" and "Chaotic". It is also found that a flow in a pipe is laminar if the Reynolds Number (based on diameter of the pipe) is less than 2100 and is turbulent if it is greater than 4000. Transitional Flow prevails between these two limits.	Understand	CLO7	CAME008.07
UNIT – III					
1	What is a boundary layer?	Boundary layer, in fluid mechanics, thin layer of a flowing gas or liquid in contact with a surface such as that of an airplane wing or of the inside of a pipe. The fluid in the boundary layer is subjected to shearing forces. A range of velocities exists across the boundary layer from maximum to zero, provided the fluid is in contact with the surface.	Remember	CLO9	CAME008.09

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3	What is turbulent boundary layer?	At some distance back from the leading edge, the smooth laminar flow breaks down and transitions to a turbulent flow. From a drag standpoint, it is advisable to have the transition from laminar to turbulent flow as far aft on the wing as possible, or have a large amount of the wing surface within the laminar portion of the boundary layer. The low energy laminar flow, however, tends to break down more suddenly than the turbulent layer.	Remember	CLO9	CAME008.09
4	What is the expression for momentum thickness?	$\theta = \int_0^{\delta} \frac{u}{U}\left(1-\frac{u}{U}\right)dy$	Understand	CLO9	CAME008.09
5	Define lift.	Lift is the component of this force that is perpendicular to the oncoming flow direction.	Remember	CLO9	CAME008.09
6	Define drag.	It contrasts with the drag force, which is the component of the force parallel to the flow direction. ... If the surrounding fluid is air, the force is called an aerodynamic force.	Understand	CLO10	CAME008.10
7	What is the separation of boundary layer?	Boundary layer separation occurs when the portion of the boundary layer closest to the wall or leading edge reverses in flow direction. The separation point is defined as the point between the forward and backward flow, where the shear stress is zero.	Remember	CLO10	CAME008.10
8	What is the expression for energy thickness?	$\delta^{**} = \int_0^{\delta} \frac{u}{U}\left(1-\frac{u^2}{U^2}\right)dy$	Understand	CLO10	CAME008.10
9	What is Darcy–Weisbach equation?	In fluid dynamics, the Darcy–Weisbach equation is an empirical equation, which relates the head loss, or pressure loss, due to friction along a given length of pipe to the average velocity of the fluid flow for an incompressible fluid. The equation is named after Henry Darcy and Julius Weisbach	Remember	CLO10	CAME008.10
10	What is Pressure gradient?	In atmospheric science, the pressure gradient is a physical quantity that describes in which direction and at what rate the pressure increases the most rapidly around a particular location.	Understand	CLO10	CAME008.10
12	What is the expression for local coefficient of drag?	$C_D{}^{*} = \frac{\tau_O}{\frac{1}{2}\rho U^2}$	Remember	CLO9	CAME008.09
13	How thick is the boundary layer on a wing?	As you reach the surface of your wing, the airflow's speed drops to zero. The area where friction slows down the airflow is called the boundary layer. The boundary layer isn't very deep, maybe .	Understand	CLO10	CAME008.10
14	What is displacement thickness in boundary layer?	Displacement thickness : It is defined as the distance by which the external potential flow is displaced outwards due to the decrease in velocity in the boundary layer.	Remember	CLO10	CAME008.10

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15	What is the expression for average coefficient of drag?	$C_D = \frac{F_D}{\frac{1}{2}\rho U^2}$	Understand	CLO10	CAME008.10
16	What is boundary layer resistance?	However, surrounding the leaf and covering the surface of the soil is a thin skin of unperturbed air - the boundary layer. Heat must be transferred through this layer through molecular diffusion (conduction). The long timescale involved can be represented by a large resistance - the boundary layer resistance.	Remember	CLO10	CAME008.10
17	What is Wake in boundary layer?	Boundary layer separation is the detachment of a boundary layer from the surface into a broader wake. Boundary layer separation occurs when the portion of the boundary layer closest to the wall or leading edge reverses in flow direction.	Remember	CLO9	CAME008.09
18	What is Darcy-Weisbach Equation?	$h_f = \frac{4FLV^2}{2gd}$	Understand	CLO10	CAME008.10
19	Expression for loss of head due to sudden enlargement?	$h_e = \frac{V_1^2 - V_2^2}{2g} m$	Remember	CLO10	CAME008.10
20	What is momentum thickness?	It is defined as the distance by which the boundary should be displaced to compensate for the reduction in momentum of the flowing fluid on account of boundary layer formation	Understand	CLO10	CAME008.10
21	What is free stream velocity?	The freestream is the air far upstream of an aerodynamic body, that is, before the body has a chance to deflect, slow down or compress the air. Freestream conditions are usually denoted with a symbol, e.g. , meaning the freestream velocity.	Remember	CLO10	CAME008.10
22	What is the expression for loss of head due to sudden contraction?	$h_e = \frac{1}{2} \times \frac{V_2^2}{2g} m$	Remember	CLO9	CAME008.09
23	What do you mean by downstream?	Definition of downstream. 1 : in the direction of or nearer to the mouth of a stream floating downstream located two miles downstream. 2 : in or toward the latter stages of a usually industrial process or the stages (such as marketing) after manufacture improving profits downstream downstream products.	Understand	CLO10	CAME008.10
24	What is the expression of Dupuit's for equivalent pipe?	$\frac{L}{d^5} = \frac{L_1}{d_1^5} + \frac{L_2}{d_2^5} + \frac{L_3}{d_3^5}$	Understand	CLO9	CAME008.09

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25	What is laminar sub layer?	The laminar sub layer, also called the viscous sub layer, is the region of a mainly-turbulent flow that is near a no-slip boundary and in which the flow is laminar. As such, it is a type of boundary layer	Understand	CLO9	CAME008.09
26	What are minor energy losses?	Minor losses in pipe flow are a major part in calculating the flow, pressure, or energy reduction in piping systems. Liquid moving through pipes carries momentum and energy due to the forces acting upon it such as pressure and gravity.	Understand	CLO10	CAME008.10
UNIT - IV					
1	Expression for force of jet on fixed slant vane?	$F_x = \rho a V^2.\sin^2\theta.N$	Understand	CLO10	CAME008.10
2	What is the flow direction in reaction turbine?	inward radial flow turbine. If the water flows from inwards to outwards, the turbine is known as outward radial flow turbine. Reaction turbine means that the water at inlet of turbine possesses kinetic energy as well as pressure energy. surfaces of the vanes are made very smooth.	Remember	CLO10	CAME008.10
3	What is impulse turbine?	An impulse turbine is a turbine that is driven by high velocity jets of water or steam from a nozzle directed on to vanes or buckets attached to a wheel. The resulting impulse (as described by Newton's second law of motion) spins the turbine and removes kinetic energy from the fluid flow.	Remember	CLO13	CAME008.13
4	Expression for force of jet on moving slant vane?	$F_x = \rho a(V-u)^2.\sin^2\theta.N$ $F_y = \rho a(V-u)^2.\sin\theta.\cos\theta.N$	Understand	CLO13	CAME008.13
5	What is the difference between impulse and reaction turbine?	The basic and main difference between impulse and reaction turbine is that there is pressure change in the fluid as it passes through runner of reaction turbine while in impulse turbine there is no pressure change in the runner. So it uses kinetic energy as well as pressure energy to rotate the turbine.	Remember	CLO13	CAME008.13
6	Why draft tube is used in Francis turbine?	Draft tube: The draft tube is a conduit which connects the runner exit to the tail race where the water is being finally discharged from the turbine. The primary function of the draft tube is to reduce the velocity of the discharged water to minimize the loss of kinetic energy at the outlet.	Understand	CLO13	CAME008.13
7	Expression for force of jet at center on fixed curved vane?	$F_x = \rho a V^2(1+\cos\theta).N$ $F_y = -\rho a V^2.\sin\theta).N$	Remember	CLO13	CAME008.13
8	What is degree of reaction in turbine?	In turbomachinery, Degree of reaction or reaction ratio (R) is defined as the ratio of the static pressure drop in the rotor to the static pressure drop in the	Understand	CLO13	CAME008.13

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		stage or as the ratio of static enthalpy drop in the rotor to the static enthalpy drop in the stage.			
9	What is the principle of impulse turbine?	Principle: Impulse turbine works on the basic principle of impulse. When the jet of water strikes at the turbine blade with full of its speed, it generates a large force which used to rotate the turbine.	Remember	CLO13	CAME008.13
10	What is specific speed of a turbine?	The specific speed value for a turbine is the speed of a geometrically similar turbine which would produce unit power (one kilowatt) under unit head (one meter).	Understand	CLO13	CAME008.13
11	Expression for force of jet tangential to fixed curved vane?	$F_x = 2\rho a V^2.\cos\theta..N$ $F_y = 0$	Understand	CLO13	CAME008.13
12	What is cavitation turbine?	The liquid enters hydraulic turbines at high pressure; this pressure is a combination of static and dynamic components. Cavitation also occurs at the exit of the turbine as the liquid has lost major part of its pressure heads and any increase in dynamic head will lead to fall in static pressure causing Cavitation.	Remember	CLO13	CAME008.13
13	Expression for force of jet tangential to unsymmetrical fixed curved vane?	$F_x = \rho a V^2.(\cos\theta + \cos\phi).N$ $F_y = \rho a V^2(\sin\theta - \sin\phi).N$	Understand	CLO13	CAME008.13
14	What is Jet ratio?	The jet ratio is defined as the ratio of the diameter of jet to the diameter of Pelton wheel.	Remember	CLO13	CAME008.13
15	What is turbine runner?	In hydraulic turbines, the blades are also called as runners which rotates when the fluid flows in the casing and comes in contact with it. While shaft is connecting medium between the blades and the generator which rotates when the blade is in motion thus in turn producing electricity.	Understand	CLO13	CAME008.13
16	Expression for force of jet at center on moving curved vane?	$F_x = \rho a(V-u)^2.(1+\cos\theta).N$ $F_y = -\rho a(V-u)^2.\sin\theta.N$	Understand	CLO13	CAME008.13
17	What are the disadvantages of hydropower?	Hydropower offers advantages over other energy sources but faces unique environmental challenges. Hydropower is a fueled by water, so it's a clean fuel source. Hydropower doesn't pollute the air like power plants that burn fossil fuels, such as coal or natural gas.	Remember	CLO13	CAME008.13
18	Is hydroelectricity cheap or expensive?	The best fossil fuel plants are only about 50% efficient. In the U.S., hydropower is produced for an average of 0.85 cents per kilowatt-hour	Understand	CLO13	CAME008.13

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		(kwh). This is about 50% the cost of nuclear, 40% the cost of fossil fuel, and 25% the cost of using natural gas.			
19	Expression for force of jet tangential to unsymmetrical moving curved vane?	$F_x = \rho a V_{r1}.(V_{W1} \pm V_{W2}).N$	Remember	CLO13	CAME008.13
20	What is the purpose of dam?	A dam can also be used to collect water or for storage of water which can be evenly distributed between locations. Dams generally serve the primary purpose of retaining water, while other structures such as floodgates or levees (also known as dikes) are used to manage or prevent water flow into specific land regions.	Understand	CLO13	CAME008.13
21	What are the advantages of a dam?	The advantage is linked to the purpose. You can build a dam to provide drinking water, recreation, flood control, power generation or a small dam for livestock. The advantage of each also has some possible disadvantages.	Remember	CLO13	CAME008.13
22	Will hydropower be used in the future?	Hydropower makes up 74% of the world's total renewable electricity generation and 16% of the world's electricity is generated by hydropower. The current capacity of hydropower could be tripled if all available resources are harnessed, generating around 15,000 TWh per year.	Understand	CLO13	CAME008.13
23	Expression for workdone by the jet on runner of the Pelton wheel turbine?	$\frac{WD}{s} = \rho a V_1.(V_{W1} \pm V_{W2}) \times u.\frac{N.m}{s}$	Remember	CLO13	CAME008.13
24	Expression for workdone by water on runner of the Francis turbine?	$\frac{WD}{s} = \rho a V_1.(V_{W1} \times u_1).\frac{N.m}{s}$	Remember	CLO13	CAME008.13
25	Expression for overall efficiency of Kaplan turbine?	$\eta_O = \frac{P_S}{\rho g Q H}$	Remember	CLO13	CAME008.13
UNIT - V					
1	What is Centrifugal pump?	Centrifugal pumps are a sub-class of dynamic axisymmetric work absorbing turbomachinery. Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow. The rotational energy typically comes from an engine or electric motor.	Remember	CLO13	CAME008.13

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2	Expression for workdone by the impeller on water in a centrifugal Pump?	$\frac{WD}{s} = \rho a V_1.(V_{W2} \times u_2).\frac{N.m}{s}$	Understand	CLO13	CAME008.13
3	Why Priming is important in centrifugal pump?	Liquid enters in the suction of centrifugal pump by the energy it posses (atmospheric pressure in the suction tank). In order for a centrifugal pump, or self-priming, pump to attain its initial prime the casing must first be manually primed or filled with water.	Remember	CLO13	CAME008.13
4	Why is NPSH required for pumps?	NPSH Required (NPSHR): The minimum pressure required at the suction port of the pump to keep the pump from cavitating. NPSHA is a function of your system and must be calculated, whereas NPSHR is a function of the pump and must be provided by the pump manufacturer.	Understand	CLO13	CAME008.13
5	Expression for workdone per second per unit weight of a centrifugal Pump?	$\frac{WD}{Unitweight} = \frac{w}{g}(V_{W2} \times u_2).$	Remember	CLO13	CAME008.13
6	Why cavitation occurs in centrifugal pump?	When a pump is under low pressure or high vacuum conditions, suction cavitation occurs. The pump is being "starved" or is not receiving enough flow. When this happens, bubbles or cavities will form at the eye of the impeller.	Understand	CLO13	CAME008.13
7	Expression for manometric efficiency of a centrifugal pump?	$\eta_{man.} = \frac{g.H_m}{V_{W2}.u_2}$	Remember	CLO13	CAME008.13
8	What is TDH in pumps?	In fluid dynamics, Total Dynamic Head (TDH) is the total equivalent height that a fluid is to be pumped, taking into account friction losses in the pipe.	Understand	CLO13	CAME008.13
9	Define slip in reciprocating pumps.	Slip of reciprocating pump: Slip of a pump is defined as the difference between the theoretical discharge and actual discharge of the pump	Remember	CLO13	CAME008.13
10	Expression for mechanical efficiency of a centrifugal pump?	$\eta_m = \frac{V_{W2}.u_2}{P_S.g}$	Understand	CLO13	CAME008.13
11	What are the different types of pumps for pumping water?	Centrifugal pumps are used for drawing clear water that is free from solid impurities and chemical substances. These pumps are mostly used to supply water to homes, lawn sprinklers, for filling swimming pools, draining water tanks and wells, and for irrigating small agricultural farms.	Understand	CLO13	CAME008.13
12	Which pump is used for high head?	According to Gorman-Rupp, “series pumping is a pump configuration used to overcome a high static discharge head or extremely long piping lengths	Remember	CLO13	CAME008.13

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		with high friction losses." When centrifugal pumps are connected in a line, head increases from one pump to the next, increasing fluid pressure as well.			
13	Expression for overall efficiency of a centrifugal pump?	$\eta_O = \frac{W.H_m}{P_S}$	Understand	CLO13	CAME008.13
14	What are the types of reciprocating pump?	The following are commonly known types of reciprocating pumps: Single-acting reciprocating pump: This has one suction valve and one discharge valve. ... Double-acting reciprocating pump: Unlike single acting pump, here there are two suction and delivery valves.	Remember	CLO13	CAME008.13
15	What are the main parts of reciprocating pump?	Suction Pipe. Suction Valve, Delivery Pipe. Delivery Valve, Cylinder, Piston and Piston Rod, Crank, Connecting Rod and Strainer.	Understand	CLO13	CAME008.13
16	Expression for specific speed of a centrifugal pump?	$N_S = \frac{N.\sqrt{Q}}{H_m^{3/4}}$	Understand	CLO13	CAME008.13
17	Why air vessels are provided in reciprocating pump?	1) To obtain liquid at uniform discharge. 2) Due to air vessel frictional head and acceleration head decreases and the work overcoming friction resistance in suction and delivery pipe considerably decreases which results in good amount of work. 3) Reciprocating pump can run at high speed without flow separation.	Remember	CLO13	CAME008.13
18	Why are positive displacement pumps called so?	A Positive Displacement Pumps is a also known as "constant flow machine" because it produces same flow at a given speed (RPM) no matter how much is the discharge pressure.	Understand	CLO13	CAME008.13
19	Expression for discharge through single acting reciprocating pump?	$Q_{th} = \frac{ALN}{60}.m^3/s$	Remember	CLO13	CAME008.13
20	What happen if discharge valve of centrifugal pump is closed?	If we close the valve on the discharge line which is near to the pump, pump will run at its shut off head and it will increase the temperature of fluid which will result in cavitation.	Understand	CLO13	CAME008.13
21	Why we close discharge valve of centrifugal pump before starting?	When almost any centrifugal pump is started against a closed discharge valve, the pump head will be higher than normal. Pumps that require less shut-off power and torque than at normal flow conditions are usually started against a closed discharge valve.	Understand	CLO13	CAME008.13

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
22	Expression for discharge through double acting reciprocating pump?	$Q_{th} = \frac{2ALN}{60}.m^3/s$	Remember	CLO13	CAME008.13
23	Expression for percent of slip of reciprocating pump?	$\%Slip = \frac{Q_{th} - Q_a}{Q_{th}} \times 100..m^3/s$	Remember	CLO13	CAME008.13

Signature of the Faculty **Signature of the HOD**