INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY

Course Name	:	**FLUID MECHANICS**
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Semester	:	**IV**
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Section	:	**A,B**
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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 Fluid Mechanics.	Fluid mechanics is that branch of applied mechanics that is concerned with the statics and dynamics of liquids and gases. The analysis of the behavior of fluids is based upon the fundamental laws of applied mechanics that relate to the conservation of mass, energy and momentum.	Remember	CACE005.01	1
2	What are system of units	Two primary systems of units are commonly used in Fluid Mechanics, namely, the Imperial System (sometimes called the English units) and the International System, which is referred to as SI (System International) units.	Remember	CACE005.01	1
3	Define mass density, weight density.	Mean density is defined as the ratio of a given amount of a substance to the volume that this amount occupies. It is represented by $\rho = m / V$. The SI unit for mass density is kg / m^3. Specific Weight is defined as weight per unit volume. Weight is a force. The SI unit for specific weight is N/m^3.	Remember	CACE005.01	1
4	What are the causes of Viscosity	The reason for causing the viscosity is that viscosity appears to depend on two phenomena, namely the transfer of momentum between molecules and the intermolecular (cohesive) forces between molecules of the fluid.	Remember	CACE005.01	1
4	Define vapor pressure	The activity of the molecules at the surface creates a vapour pressure, which is a measure of the rate at which the molecules leave the surface. The vapour pressure depends on the temperature, because molecular activity depends upon heat content.	Remember	CACE005.02	2
5	Express the units of pressure in various systems	pressures of large magnitude are expressed in atmospheres (atm). One atmosphere is taken as 1.03125×10^5 Pa. A pressure of 10^5 is called a bar. For pressures less than that of the atmosphere, the units are normally expressed as millimeters of mercury vacuum.	Understand	CACE005.04	4
6	State hydro static law	A Hydrostatics Law state that rate of increase of pressure in a vertically downward direction in fluid/liquid is equal to weight density of the liquid.	Remember	CACE005.06	6
7	Mention the devices used to measure the pressure	Piezometer, manometer and pressure gauges	Remember	CACE005.03	3
8	Mention the working principle of piezometer	It is used for measuring the pressure inside a vessel or pipe in which liquid is present. A tube may be attached to the walls of the container in which the liquid resides so that liquid can rise in the tube. It is a very simple and accurate pressure measuring device.	Remember	CACE005.03	3
9	What is the difference between the function of manometers	Standard manometers are used to measure the pressure in a container by comparing it to normal atmospheric pressure. Differential manometers are also used to compare the pressure of two different containers.	Understand	CACE005.06	6

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
10	State Newton's law of viscosity	The shear stress on a fluid element layer is directly proportional to the rate of shear strain.	Remember	CACE005.02	2
12	Differentiate Newtonian and non – Newtonian fluids	Fluid which obey that shear stress on a fluid element is directly proportional to the rate of shear strain is called Newtonian fluids. Fluid which does not obey that shear stress on a fluid element is not directly proportional to the rate of shear strain is called non – Newtonian fluids.	Remember	CACE005.02	2
13	Define specific volume of a fluid	Specific volume of a fluid is defined as the volume of a fluid occupied by a unit mass or volume per unit mass of a fluid. It is the reciprocal of mass density.	Remember	CACE005.02	2
14	What is meant by kinematic viscosity?	It is defined as the ratio between the dynamic viscosity and density of mass fluid.	Understand	CACE005.02	2
15	Define fluids	A fluid is a substance that may flow. Fluids do not offer any lasting resistance to the displacement of one layer over another when a shear force is applied. This means that if a fluid is at rest, then no shear forces can exist in it, which is different from solids.	Understand	CACE005.01	1
16	Mention the concept of continuum.	The behavior of the molecules in a fluid is very complex, continuously varying and may vary different from neighboring molecules at any instant of time.	Understand	CACE005.01	1
17	Briefly discuss about dimensions and units	Physical quantities require quantitative descriptions when solving engineering problems. There are nine quantities considered to be fundamental magnitudes, and they are: length, mass, time, temperature, amount of a substance, electric current, luminous intensity, plane angle, and solid angle. The magnitudes of all the quantities can be expressed in terms of the fundamental magnitudes.	Remember	CACE005.01	1
18	What are the basic properties of a fluid.	Density (Mass density and weight density), Compressibility, Surface Tension, capillarity, vapor Pressure, Viscosity, Pressure, Specific gravity, Bulk modulus.	Remember	CACE005.01	1
19	Define specific gravity	It is a dimensionless unit defined as the ratio of the density of a substance to the density of water - at a specified temperature and can be expressed as $SG = \rho_{substance} / \rho_{H2O}$. It is common to use the density of water at 4 ^oC (39 ^oF) as a reference since water at this point has its highest density of 1000 kg/m^3	Remember	CACE005.01	1
20	Define viscosity	It is one of the properties that controls the amount of fluid that can be transported in a pipeline during a specific period of time. The resistance to the movement of one layer of fluid over an adjoining one is due to the viscosity of the fluid.	Remember	CACE005.01	1
21	Define surface tension	Surface tension is the surface force that develops at the interface between two immiscible liquids or between liquid and gas or at the interface between a liquid and a solid surface. The presence of surface tension and its dynamics are due to complex interactions at the molecular level along interfaces. The magnitude of surface tension is defined as that of the tensile force acting across and perpendicular to a short, straight element of the line drawn in the surface divided by the length of that line.	Remember	CACE005.01	1

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22	Define pressure	Pressure, which is a scalar quantity, is defined as the ratio of the force and the area, that is F/A. The units are: the Pascal (Pa) N/m^2.	Remember	CACE005.03	3
23	State Pascal's Law	A change in pressure at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid. It can also be called as the principle of transmission of fluid-pressure.	Remember	CACE005.04	4
24	What is the difference between Absolute pressure and Gauge pressure	Absolute pressure is zero-referenced against a perfect vacuum, so it is equal to gauge pressure plus atmospheric pressure. Gauge pressure is zero-referenced against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure.	Understand	CACE005.02	2
25	How do you measure the pressure based on magnitude	Low pressure measurement for the range <0.1 torr - McLeod Gage, Pirani Gage, Ionization Gage and Knudsen gage. Moderate pressure measurement: Manometers and elastic elements. High pressure measurement devices based on the electrical resistance change of a Manganin or gold-chrome wire	Remember	CACE005.03	3
26	Mention the importance of manometers	A manometer is a device that measures the difference in pressure between two points. Differential manometers can range from devices simple enough to be built at home to complex digital equipment.	Remember	CACE005.03	3
27	Define center of pressure and total pressure	Total pressure is defined as the force exerted by static fluid on a surface when the fluid comes in contact with the surface. Center of pressure is defined as the point of application of the total pressure on the surface.	Remember	CACE005.06	6
28	Classify fluids based on Newton's law of viscosity	Ideal fluid, real fluid, Newtonian fluid, Non – Newtonian fluid, Ideal plastic fluid, Dilatant fluid, Thixotropic substance.	Remember	CACE005.02	2
29	What is meant by real fluid s and ideal fluids.	Real fluids are those which possess viscosity. Ideal fluids are those which is incompressible and having no viscosity. These are also called as Imaginary fluids.	Understand	CACE005.02	2
30	Define cavitation	It is the phenomenon of formation of vapour bubbles of a flowing liquid in a region where the pressure of liquid falls below the vapor pressure and sudden collapsing of these vapor bubbles in a region of high pressure.	Remember	CACE005.03	3
31	State the uses of various manometers.	Simple manometers are used for measuring pressure at a point and differential manometers are used of measuring the difference of pressures between the two points in a pipe or two different pipes.	Remember	CACE005.02	2
UNIT – II					

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
1	How do you describe the fluid particles	It may be described by any of the following two methods: 1. Lagrangian method Eulerian method	Remember	CACE005.07	7
2	Define Uniform and non – uniform flows	Uniform flow is the type of the flow in which the fluid properties does not change with respect to space. Non – uniform flow is the type of flow in which the fluid properties changes with respect to space.	Remember	CACE005.08	8
3	Define laminar flow in a pipe	A laminar flow is the one in which the liquid particles move one over the other or moves in straight and parallel paths.	Remember	CACE005.08	8
4	Define compressible and incompressible flow	Compressible flow is the type of flow in which the mass density of the fluid changes from point to point. Incompressible flow is the type of the flow in which the mass density is constant during the entire flow of fluid or liquid.	Remember	CACE005.08	8
5	Define stream line	Stream line is defined as an imaginary line within the flow so that the tangent at any point on it indicates the velocity at that point.	Understand	CACE005.10	10
6	State the continuity equation	If no fluid is added or removed from the pipe in any length then the mass passing across different sections shall be the same.	Remember	CACE005.07	7
7	Define velocity potential and stream function	Velocity potential is defined as a scalar function of space and time such that its negative derivative with respect to any direction gives the fluid velocity in that direction. Stream function is defined as the flux or flow rate between two stream lines.	Remember	CACE005.10	10
8	Define hydro kinematics	The science which deals with the geometry of motion of fluids without reference to the forces causing the motion	Remember	CACE005.09	9
9	Define center of buoyancy	It is defined as the point, through which the force of buoyancy is supposed to act. As the force of buoyancy is a vertical force and is equal to the weight of the fluid displaced by the body, the center of buoyancy will be center of gravity of the fluid displaced.	Remember	CACE005.08	8
10	What is Meta – center height	The distance between the meta center of a floating body and the center of gravity of the body is called meta center height.	Remember	CACE005.08	8
11	What is the condition for stable equilibrium of a floating body	The condition for stable equilibrium of a floating body is that the point of Meta center (M) is above the center of gravity (G).	Understand	CACE005.08	8
12	What is the condition for neutral equilibrium of a floating body	The condition for neutral equilibrium of a floating body is that the point of Meta center (M) is coincides with the center of gravity (G).	Understand	CACE005.08	8

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
13	What is the condition for unstable equilibrium of a sub - merged body	The condition for unstable equilibrium of a sub - merged body is that the point of Buoyancy (B) is below the center of gravity (G).	Understand	CACE005.08	8
14	Define rate of flow	The rate of flow or discharge is defined as the quantity of a liquid flowing per second through a section of pipe or a channel. Generally denoted by Q.	Remember	CACE005.12	12
15	Define transitional flows in a pipe	Transitional flow is the one in which the state of liquid particles changes from laminar to turbulent flow.	Remember	CACE005.09	9
16	Define linear translation of a fluid	It is defined as the movement of a fluid element in such a way that it moves bodily from one position to another position in a linear or parallel way.	Remember	CACE005.11	11
17	Define angular deformation of a fluid particle.	It is defined as the average change in the angle contained by the two adjacent sides.	Remember	CACE005.11	11
18	Define fluid kinematics	It is a branch of fluid mechanics which deals with the study of velocity and acceleration of the particles of fluids in motion and their distribution in space without considering any force involved in it.	Remember	CACE005.07	7
19	Define steady and unsteady flow	Steady flow may be defined as the flow in which the fluid characteristics do not change with time. Unsteady flow is the type of flow in which the fluid properties changes with respect to time.	Remember	CACE005.08	8
20	Define rotational and irrotational flow	Rotational flow is the type of flow in which if the fluid particles while moving in the direction of flow rotate about their mass centers. Irrotational flow is the type of the flow in which if the fluid particles does not rotate about its mass centers.	Remember	CACE005.08	8
21	How do you find the different types of flows in a pipes.	The different types of flows in a pipes is determined by using Reynolds number (Re). 1. If Re < 2000 – Laminar flow 2. If Re > 4000 – Turbulent flow If 2000 < Re < 4000 – Transitional flow	Remember	CACE005.07	7
22	Define path line,	Path line is defined as the path followed by a fluid particle in motion. It shows the direction of particular particle as it moves ahead.	Understand	CACE005.10	10
23	Define streak line	Streak line is defined as a curve which gives an instantaneous picture of location of the fluid particles, which have passed through a given point.	Understand	CACE005.10	10
24	Define circulation	It is defined as the line integral of the tangential velocity about a closed path.	Remember	CACE005.10	10
25	Define flow net	A grid obtained by drawing a series of stream lines and equipotential lines is known as flow net.	Remember	CACE005.10	10

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26	Define buoyancy	When a body is immersed in a fluid, an upward force is exerted by the fluid on the body. This upward force is equal to the weight of the fluid displaced by the body and is called as the force of buoyancy.	Remember	CACE005.08	8
27	Define meta center	It is defined as the point about which a body starts oscillating when the body is tilted by a small angle. It may also be defined as the point at which the line of action of the force of buoyancy will meet the normal axis of the body when the body is given a small angular displacement.	Remember	CACE005.08	8
28	What is meant by neutral equilibrium	If the point of meta center (M) ids at the center of gravity of the body, the floating body will be the neutral equilibrium.	Remember	CACE005.08	8
29	What is the condition for unstable equilibrium of a floating body	The condition for unstable equilibrium of a floating body is that the point of Meta center (M) is below the center of gravity (G).	Understand	CACE005.08	8
30	What is the condition for stable equilibrium of a sub – merged body	The condition for stable equilibrium of a sub - merged body is that the point of Buoyancy (B) is above the center of gravity (G).	Understand	CACE005.08	8
31	What is the condition for neutral equilibrium of a sub - merged body	The condition for neutral equilibrium of a sub - merged body is that the point of buoyancy (B) and the center of gravity (G) coincides.	Understand	CACE005.08	8
32	Define turbulent in a pipe	Turbulent flow is the one in which the liquid particles does not move in a fixed path rater moves in zig – zag manner.	Remember	CACE005.09	9
33	Mention any two applications of flow – net.	Following are some the applications of flow net. To determine the stream line and equipotential lines. To determine the quantity of seepage and upward lift pressure below hydraulic structures.	Understand	CACE005.08	8
34	Define linear deformation of a fluid	The axis of the element in the deformed position and un – deformed position are parallel, but their lengths changes.	Remember	CACE005.11	11
35	Define rotation of a fluid particle.	It is defined as the movement of a fluid element in such a way that both of its axes rotate in the same direction.	Remember		
UNIT – III					
1	Define hydro dynamics	The science which deals with the geometry of motion of fluids either by the consideration of force or without reference to the forces causing the motion	Remember	CACE005.12	12
2	State Euler's equation of motion	It is obtained by integrating the Bernoulli's equation with in the specified limits area of the particles,	Remember	CACE005.12	12

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3	What are the assumptions made in derivation of the Bernoulli's equation	Following are some the assumptions made in deriving Bernoulli's equation. 1. The fluid is ideal 2. The flow is steady 3. The flow is incompressible The flow is irrotational.	Remember	CACE005.12	12
4	What is orifice meter	A device which is an opening usually round, located in the side of the tank or reservoir, for measuring the flow of a liquid.	Remember	CACE005.12	12
5	Mention the working of rotameter	When the rate of flow increases the float rises in the tube and consequently there is an increase in the annular area between the float and the tube. Thus the float rides higher or lower depending on the rate of the flow.	Remember	CACE005.12	12
6	State Newton's second law of motion	The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.	Remember	CACE005.13	13
7	Mention some applications impulse – momentum equation	Impulse – momentum is used in the following types of problems. 1. Pipe bends 2. Reducers 3. Moving vanes 4. Jet propulsions 5. Sudden enlargement in pipes Hydraulic jump in channels	Remember	CACE005.13	13
8	Define momentum correction factor	It is defined as the ratio of momentum of the flow per second based on actual velocity to the momentum of the flow per second based on average velocity across a section.	Remember	CACE005.13	13
9	Define vortex motion	It is defined as a motion in which the whole fluid mass rotates about an axis.	Remember	CACE005.13	13
10	Define free flow vortex	It is one in which the fluid mass rotates without any external impressed contact force.	Remember	CACE005.14	14
12	What are the different types of head available in a pipe flow.	Potential head or datum head 1. Velocity head Pressure head	Remember	CACE005.14	14
13	Differentiate between a pipe and channel	A pipe is a closed surface in which the top surface of the liquid is not exposed to atmosphere. A channel is a water body in which the top surface of the liquid is exposed to atmosphere.	Remember	CACE005.14	14
14	Classify the different types of notches based on shapes	Following are the different types of notches based on their shapes. 1. Rectangular notch	Remember	CACE005.14	14

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		2. Triangular notch 3. Trapezoidal notch and Stepped notch			
15	Describe broad crested weir	Broad crested weirs are widely used for flow measurement and regulation of water depth in rivers, canals and other natural open channels. The flow rate calculations can be made with a rather simple equation if the weir height is great enough to cause critical flow over the weir crest.	Understand	CACE005.14	14
16	Define Coefficient of discharge	It is defined as the ratio of actual discharge to the theoretical discharge	Remember	CACE005.14	14
17	Define coefficient of velocity	It is defined as the ration of actual velocity to theoretical velocity.	Remember	CACE005.14	14
18	State Bernoulli's equation	In an ideal incompressible fluid when the flow is steady and Continous the sum of pressure energy, kinetic energy and datum energy is constant along a stream line	Remember	CACE005.12	12
19	Mention some practical applications of Bernoulli's equation	The applications of Bernoulli's equation are seen in the flowing devices Venturimeter Orifice meter Rotameter and elbow meter Pitot tube		CACE005.12	12
20	What is Venturimeter	A device which is inserted into pipeline to measure incompressible fluid flow rates.	Remember	CACE005.12	12
21	What is pitot tube	It is one of the most accurate devices for the measurement of velocity which works on the principle that if the velocity of flow at a point becomes zero, the pressure is increased due to conversion of kinetic energy into pressure.	Remember	CACE005.12	12
22	Mention the working of elbow meter	When the liquid flows around a pipe bend there is an increase in pressure with radius, (i.,e) the pressure at the outer wall of the bend is more than that at the inner wall. This difference of pressure which exists between the outside and inside of the bend is used for the measurement of discharge in the pipeline.	Understand	CACE005.13	13
23	State impulse momentum equation	The impulse – momentum equation is stated as the net force acting on a mass of fluid is equal to change in momentum of flow per unit time in that direction.	Remember	CACE005.13	13
24	Define Kinetic energy correction factor	It is defined as the ratio of kinetic energy of flow per second based on actual velocity across a section to the kinetic energy of flow per second based on average velocity across the same section.	Remember	CACE005.13	13
25	Define momentum of momentum equation	The resulting torque acting on a rotating fluid is equal to the rate of change of momentum of momentum.	Remember	CACE005.13	13
26	Define forced vortex flow	It is one in which the fluid mass is made to rotate by means of some external agency. It is also called as flywheel vortex or rotational vortex.	Understand	CACE005.14	14

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27	Mention some applications of free flow vortex	Following are some of the examples of free vortex flow. 1. Flow around a circular bend 2. A whirlpool in a river Flow of liquid in a centrifugal pump casing after it has left the impeller	Remember	CACE005.14	14
28	Define free liquid of jet	A jet of liquid from the nozzle in atmosphere is called free liquid jet. The parabolic path traversed by the liquid under jet the action of gravity is known as trajectory	Remember	CACE005.14	14
29	Define notch	It is defined as the bottom edge, over which the liquid flows, is known as sill or crest of the notch and the sheet of liquid flowing over a notch (or a weir) is known as nappe or vein. A notch is, usually made of a metallic plate and is used to measure the discharge of liquids.	Remember	CACE005.14	14
30	What is the difference between notch and weir	A structure, used to dam up a stream or river, over which the water flows, is called a weir. A notch is, sometimes, called as a weir and vice versa. The only difference between a notch and a weir is that the notch of a small size and the weir is of a bigger one.	Remember	CACE005.14	14
31	Mention the important components of a Venturimeter.	Following are the important components of a Venturimeter device. Short converging part Throat Long diverging part	Remember	CACE005.14	14
32	Define coefficient of contraction.	It is defined as the proportion between the areas of the pipe at the vena contracta to the area of the orifice	Remember	CACE005.14	14
33	What is principle involved in the momentum equation	The momentum equation is based on the law of conservation of momentum or on the principle of momentum.	Understand	CACE005.14	14
34	State Bernoulli's equation	In an ideal incompressible fluid when the flow is steady and Continous the sum of pressure energy, kinetic energy and datum energy is constant along a stream line	Remember	CACE005.12	12
UNIT - IV					
1	Define boundary layer	The variation of velocity from zero to free –stream velocity in the direction normal to the boundary in a narrow region in the vicinity of solid boundary is called boundary layer.	Remember	CACE005.19	19
2	Define displacement thickness.	It is defined as the distance, measured perpendicular to the boundary of the solid body, by which the boundary should be displaced to compensate for the reduction in flow rate on account of boundary layer formation. It is denoted by δ^*	Remember	CACE005.19	19
3	Define energy thickness.	It is defined as the distance measured perpendicular to the boundary of the solid body, by which the boundary should be displaced to compensate for the reduction in kinetic	Remember	CACE005.19	19

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		energy of the flowing fluid on account of boundary layer formation. It is denoted by δ**.			
4	What is meant by local coefficient of drag	It is defined as the ration of the shear stress to the quantity $\frac{1}{2}\rho U^2$. It is generally denoted by C_D^*	Understand	CACE005.20	20
5	Mention the applications of Von Karman momentum integral equation.	The applications of Von Karman integral momentum equation is seen in 1. Laminar boundary layers 2. Transition boundary layer and Turbulent boundary layer flows.	Remember	CACE005.20	20
6	Define laminar sub layer	It is defined as for a turbulent boundary layer, if the boundary is smooth, the roughness projections are covered by a very thin layer which remain laminar, called as laminar sublayer.	Remember	CACE005.20	20
7	Define the point of separation for boundary layer.	The point on the body at which the boundary layer is on the verge of separation from the surface is called point of separation.	Remember	CACE005.21	21
8	***Mention the separation of boundary layer occurs in which cases***	The separation of boundary layer occurs in following cases. 1. Diffusers 2. Open channel transitions 3. Pumps 4. Fans 5. Aerofoils and Turbine blades	Understand	CACE005.21	21
9	***Define Lift force.***	The component of force at right angles to the direction of flow is called lift foce.	Remember	CACE005.21	21
10	***Define bluff body***	A body whose surface does not coincide with streamlines when placed in a flow is called a bluff body.	Remember	CACE005.22	22
11	***Mention some applications of stokes' law.***	Following are some of the applications of Stokes' law. 1. To calculate terminal velocity of a falling sphere and hence the velocity of the fluid. 2. Desilting river flow. 3. Separating the coolant from metal chips in machining operations. Sanitary engineering – treatment of raw water and sewerage use.	Remember	CACE005.22	22
12	What is Magnus effect.	The generation of lift by spinning the cylinder in a fluid stream is called Magnus effect.	Remember	CACE005.22	22
13	What is meant by chord line, profile center line of an Airfoil.	Chord line is defined as the line joining the leading and trailing edges of the airfoil. The length of the line is known as Chord of airfoil. Profile centerline is the line joining the midpoints of the profile.	Remember	CACE005.22	22

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14	Define aspect ratio of an airfoil.	The ratio of span of the wing to its mean chord is called aspect ratio of a wing.	Remember	CACE005.23	23
15	When the condition of steady – state of a flying object is obtained.	The condition for steady – state of a flying object is obtained when the weight of airplane is equal to the total lift and thrust force developed by the engine is equal to the drag force.	Understand	CACE005.23	23
16	What is meant by displacement thickness.	It is defined as the distance from the boundary of the solid body measured in the Y – direction to the point, where the velocity of the fluid is approximately equal to 0.99 times the free stream velocity of the fluid. It is generally denoted by (δ)	Remember	CACE005.19	19
17	Define momentum thickness.	It is defined as the distance, measured perpendicular to the boundary of the solid body, by which the boundary should be displaced to compensate for the reduction in momentum of the flowing fluid on account of formation of boundary layer formation. It is denoted by θ.	Remember	CACE005.19	19
18	Define drag force	drag also called air resistance, a type of friction, or fluid resistance, or fluid friction is a force acting opposite to the relative motion of any object moving with respect to a surrounding fluid.	Remember	CACE005.20	20
19	What is average coefficient of drag	It is defined as the ratio of the total drag force to the quantity $\frac{1}{2}A\rho U^2$. It is also simply called as coeffienct of drag and denoted by C_D.	Remember	CACE005.20	20
20	Mention the methods of separating / prevention of boundary layer.	Following are some the methods to separate boundary layer from the body. 1. Suction of slow moving fluid by a suction slot. 2. Supplying additional energy from blower 3. Providing a bypass in the slotted wing. 4. Rotating boundary in the direction of flow. 5. Providing small divergence in a diffuser. Providing guide – blades in a bend.	Understand	CACE005.20	20
21	What is the importance of Von Karman momentum equation	It is used to find out the frictional drag on smooth flat plate for both laminar and turbulent boundary layers.	Remember	CACE005.21	21
22	Mention the factors which influence the flow separation	The flow separation depends on the following factors. 1. The curvature of the surface 2. The Reynolds number The roughness of the surface	Remember	CACE005.21	21
23	Define drag force	The component of force in the direction of flow (free surface) on a submerged body is called the drag force.	Remember	CACE005.21	21
24	Define stream lined body.	A body whose surface coincides with the stream lines when placed parallel in a flow is called a stream lined body.	Remember	CACE005.22	22

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
25	What is terminal velocity	It is defined as the maximum velocity attained by a falling body.	Remember	CACE005.22	22
26	What are the stagnation points for the flow around submerged bodies.	It is defined as those points on the surface of the cylinder, where the velocity is zero.	Remember	CACE005.22	22
27	Mention the applications of Magnus effect.	The Magnus effect is applied in the following conditions. 1. Propulsion of ships. In spinning of tennis & cricket balls.	Understand	CACE005.22	22
28	What is meant by Angle of attack, camber and stall of an Airfoil.	Angle of attack is the angle between the chord line and direction of the fluid stream. Camber is the curvature of an airfoil. Stall is the condition when the angle of attack of an airfoil is greater than the angle of attack at maximum lift.	Remember	CACE005.23	23
29	Mention the constituents of total drag.	The total drag constitutes of two parameters namely: Pressure drag and Friction drag.	Remember	CACE005.23	23
30	Name the forces acting in the state of terminal velocity.	Following are the forces acting on the body at the terminal velocity state are: 1. Weight of body (W) acting downward. 2. Drag force (Fd) acting vertically upwards. Buoyant force on the body acting vertically upward direction.	Remember	CACE005.23	23
UNIT - V					
1	Define the term Hydraulic gradient line.	It is defined as the line which gives the sum of pressure head and datum head of a flowing fluid with respect to some reference line.	Remember	CACE005.15	15
2	Define the word major loss in pipes	The loss of energy or head due to friction in a pipe is known as major loss.	Remember	CACE005.15	15
3	State the applications of Reynolds experiment.	1. Reynolds number plays an important role in the calculation of the friction factor fluid mechanics, including the Darcy-Weisbach equation. 2. It plays an important part in the testing of wind lift on aircraft. It is used when modeling the movement of organisms swimming through water.	Remember	CACE005.15	15
4	How the head losses are effected for the turbulent flow?	1. Proportional to the length of the pipe 2. Proportional to the square of the velocity 3. Increases with surface roughness 4. Is a function of density and viscosity Is independent of pressure	Understand	CACE005.15	15

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
5	Mention the characteristics of turbulent flow	The Reynolds's number is greater than 4000. The flow is non-viscous. The fluid particles cross each other and in zig - zag manner. The flow is unsteady and non-uniform.	Remember	CACE005.17	17
6	Define the term lift	The component of the total force in the direction perpendicular to the direction of motion is known as lift.	Remember	CACE005.17	17
7	Mention the characteristics of closed conduit flow	Pressure is the dominant force. The surface of fluid is not exposure to atmosphere.	Remember	CACE005.17	17
8	***Define the term terminal velocity of a body.***	It is defined as the maximum constant velocity of a falling body such as sphere or a composite body with which the body will be travelling.	Remember	CACE005.17	17
9	Mention the factors leading to minor losses in pipe.	Following are some of the factors which leads minor losses in the pipe. 1. Sudden expansion 2. Sudden contraction 3. Bends in pipes 4. At the entrance of the pipe 5. At the exit of the pipe Due to obstructions in the pipe.	Remember	CACE005.17	17
10	When the pipes are said to be connected in series?	If the pipes of different lengths, diameters are connected end to end, then the connection is said to be in series. They are also called as compound pipes.	Understand	CACE005.17	17
11	Define the term equivalent pipe?	A single pipe of uniform diameter, having same discharge and same loss of head as compound pipe consisting of several pipes of different lengths and diameters it is known as equivalent pipe. The corresponding diameter of equivalent pipe is called equivalent size of the pipe.	Remember	CACE005.16	16
12	What are the factors which effect water hammer.	Following are the factors which effect the water hammer are: 1. The velocity of flow of water in pipe 2. The length of pipe 3. Time taken to close the valve Elastic properties of the material of pipe	Remember	CACE005.16	16
13	What is meant by branching pipe system.	If three or more reservoirs are connected by means of pipes, having one or more junctions, the system is called branching of pipe system.	Understand	CACE005.16	16
14	What is the effect of change in Reynold's number on friction factor in turbulent flow?	Based on the formula of Reynold's number, if the value of Re increases the friction factor increases in turbulent flow	Remember	CACE005.16	16
15	What is the condition for the network of pipes connected in parallel for discharge and head losses.	If the pipes are connected in parallel, following are the conditions necessary. $h_f = h_{f1} + h_{f2}$ and discharges in all the pipes are equal.	Remember	CACE005.16	16

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
16	Define the total energy line	It is defined as the line which gives the sum of pressure head, kinetic head and datum head of a flowing fluid with respect to some reference line.	Remember	CACE005.15	15
17	Define the term minor loss in pipes	The loss of energy due to change of velocity of the fluid in magnitude or direction is called minor loss.	Remember	CACE005.15	15
18	What are the formulas used to estimate losses in turbulent flow occurs in a .pipe	1. Colebrook formula 2. Moody diagram 3. Swamee – Jain formula	Remember	CACE005.15	15
19	Specify the characteristics of laminar flow	The Reynolds's number is less than 2000. The flow is viscous. The fluid particles do not cross each other. The flow is steady and uniform.	Remember	CACE005.15	15
20	Define the term drag	The component of the total force in the direction of motion is called drag. Drag is the force exerted by the fluid in the direction of motion.	Remember	CACE005.17	17
21	Specify the characteristics of transitional flow	The Reynolds's number is lies in between 2000 to 4000. The flow pattern changes from laminar to turbulent flow.	Understand	CACE005.17	17
22	Define the word bluff body	It is defined as that body whose surface does not coincide with the stream lines, when the body is placed in a flow.	Remember	CACE005.17	17
23	Mention the factors leading to major losses in pipe.	Following are some of the factors which leads major losses in the pipe. 1. Length of pipe 2. Surface of pipes (Smooth or rough) 3. Diameter of the pipe 4. Velocity of liquid particles Chezy's constant based on pipe material	Remember	CACE005.17	17
24	What is meant by Syphon?	It is a long bent pipe used to transfer liquids from a reservoir at a higher level to another reservoir at a lower level.	Remember	CACE005.17	17
25	When the pipes are said to be connected in parallel?	If the pipes of different lengths, diameters are connected parallel in the form of a network, then the connection is said to be in parallel.	Remember	CACE005.16	16
26	Define water hammer.	The wave of high pressure will be transmitted along the pipe with a velocity equal to the velocity of sound wave and may create noise called knocking. Also, this wave of high pressure has the effect of hammering action on the walls of the pipe and hence it is known as water hammer.	Understand	CACE005.16	16
27	What are the necessary conditions for any pipe network.	Following are the basic and necessary conditions for any pipe network to be satisfied. 1. The flow into each junction must be equal to the flow out of the junction. The algebraic sum of head losses round each loop must be zero.	Remember	CACE005.16	16
28	What are the methods to determine the coefficient of viscosity.	The following are the experimental methods for determining the coefficient of viscosity of a liquid. 1. Capillary tube method 2. Falling sphere resistance method	Remember	CACE005.16	16

S No	QUESTION	ANSWER	Blooms Level	CLO	CLO Code
		3. Rotating cylinder method Orifice type viscometer			
29	What is the condition for the network of pipes connected in series for discharge and head losses.	If the pipes are connected in series, following are the conditions necessary. $Q = Q_1 + Q_2$ and head losses in all the pipes are equal.	Remember	CACE005.16	16
30	What is the relation between Reynold's number and friction factor in case of turbulent flows	The following relation exists between the Reynold's number and friction factor: $f = \frac{64}{R_e}$	Understand	CACE005.16	16

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