INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**HYDRAULICS AND HYDRAULIC MACHINERY**
Course Code	:	**ACE011**
Program	:	**B. Tech**
Semester	:	**V**
Branch	:	**Civil Engineering**
Section	:	**A & B**
Academic Year	:	**2019 - 2020**
Course Faculty	:	**Dr. P. Ram Mohan Rao, Professor & Head** **Mr. Ch. V. S. S. Sudheer, Assistant Professor**

COURSE OBJECTIVES:

The course should enable the students to:	
I	Strengthen the knowledge of theoretical and technological aspects of hydrodynamic forces on jets.
II	Correlate the principles with applications in hydraulic turbines.
III	Apply the practical applications on Francis and Kaplan turbine.
IV	Analysis the similarities between prototype and model types of hydraulic similitude.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
MODULE-I						
1	Define open channel flow	Flow of liquid with a free surface (i.e., surface exposed to atmosphere) through any passage is known as open channel flow	Remember	CO 1	CLO 1	ACE011.01
2	Define the term uniform flow.	If the depth of flow, slope of the bed of channel and cross section remain constant with respect to distance is called uniform flow.	Remember	CO 1	CLO 1	ACE011.01
3	What is Gradually varied flow	If the depth of flow changes gradually over a long length of the channel.	Remember	CO 1	CLO 1	ACE011.01
4	What is Rapidly varied flow	If the depth of flow changes rapidly over a small length of the channel.	Remember	CO 1	CLO 2	ACE011.02
5	What the formula for Froude number	Froute Number = F = $\frac{V}{\sqrt{g\,X\,D}}$	Remember	CO 1	CLO 2	ACE011.02
6	Define hydraulic mean depth of the channel	Ratio of cross sectional area of flow to top width of the channel	Remember	CO 1	CLO 3	ACE011.03

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7	Define specific energy.	Depth of flow of water at which the specific energy. E is minimum is called as critical depth (y_c)	Remember	CO 1	CLO 3	ACE011.03
8	Define critical flow.	Depth of flow of water at which the specific energy is minimum.	Remember	CO 1	CLO 3	ACE011.03
9	Define sub critical flow.	When the depth of flow in a channel is less than the critical depth yc. It is also called as called as streaming flow or tranquil flow.	Remember	CO 1	CLO 3	ACE011.03
10	Define super critical flow.	When the depth of flow in a channel is greater than the critical depth yc. It is also called as called as streaming flow or tranquil flow.	Remember	CO 1	CLO 4	ACE011.04
11	Define Prismatic channel	Geometric dimensions of the channel, such as cross section and bottom slope are constant throughout the length of the channel.	Remember	CO 1	CLO 4	ACE011.04
12	Define critical velocity.	Velocity of flow at the critical depth is called critical velocity Vc.	Remember	CO 1	CLO 5	ACE011.05
13	Define Non-prismatic channel	Geometric dimensions of the channel, such as cross section and bottom slope are constant for length of the channel.	Understand	CO 1	CLO 5	ACE011.05
14	Define specific force and What is specific energy	Specific force is the sum of the pressure force (F) and momentum force due to flow (M) per unit weight of the liquid at a section. Specific Energy E = $y + \frac{v^2}{2g}$	Remember	CO 1	CLO 5	ACE011.05
15	Define the flows in open channel based on Froude Number (F_r)	If F_r = 1, Critical flow If F_r < 1, Sub – critical flow If F_r > 1, super critical flow	Remember	CO 1	CLO 5	ACE011.05
MODULE-II						
1	Define secondary units	Secondary or Derived quantities are those quantities which possess more than one fundamental dimension	Remember	CO 2	CLO 6	ACE011.06
2	Define Dimensional homogeneity	If the dimensions of each term on both sides of an equation are the same the equation is known as dimensionally homogenous equation.	Remember	CO 2	CLO 6	ACE011.06
3	Name the Methods of Dimensional Analysis	If the number of variable involved in a physical phenomenon are known, then the relation among the variables can be determined by the following two methods. 1. Rayleigh"s method 2. Buckingham"s (π – theorem) method	Understand	CO 2	CLO 6	ACE011.06

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4	Write the dimensions for the following quantities. Modulus of elasticity, Surface tension, Dynamic viscosity and Torque	Modulus of elasticity - $ML^{-1}T^{-2}$ Surface tension - MT^{-2} Dynamic viscosity - $ML^{-1}T^{-1}$ Torque - $ML^{2}T^{-2}$	Understand	CO 2	CLO 7	ACE011.07
5	State Buckingham's π Method	If there are n – variables in a physical phenomenon and those n-variables contain "m" dimensions, then the variables can be arranged into (n-m) dimensionless groups called π terms.	Understand	CO 2	CLO 8	ACE011.08
6	Which of the following properties are used to select Repeating variables	a. Geometric property - Length , Height, Width, Area b. Flow property - Velocity, Acceleration, Discharge c. Fluid property – Mass Density, Viscosity, Surface Tension	Remember	CO 2	CLO 8	ACE011.08
7	Define similitude	It is defined as the similarity between the prototype and its model.	Remember	CO 2	CLO 9	ACE011.09
8	Define Geometric similarity	if the ratio of corresponding linear dimensions between model and prototype are equal.	Remember	CO 2	CLO 10	ACE011.10
9	Define Kinematic similarity	if quantities such as velocity and acceleration at corresponding points on model and prototype are same.	Remember	CO 2	CLO 10	ACE011.10
10	Define Dynamic Similarity	if ratio of forces at corresponding points of model and prototype is constant.	Remember	CO 2	CLO 11	ACE011.11
11	Define Reynolds number	The ratio of inertia force of the fluid to viscous force.	Remember	CO 2	CLO 11	ACE011.11
12	Define Froude number	The ratio of square root of inertia force to gravity force	Remember	CO 2	CLO 10	ACE011.10
13	Define Reynolds's Model Law	Flow in model and prototype can be established if Re is same for both the system.	Remember	CO 2	CLO 10	ACE011.10
14	Define Froude's Model Law	When the force of gravity is predominant in addition to inertia force then similarity can be established by Froude"s number.	Remember	CO 2	CLO 11	ACE011.11
15	Write dimensionless number	Reynolds number, Froude number, Euler's number, Weber's number and Mach number.	Remember	CO 2	CLO 11	ACE011.11
MODULE-III						
1	What is the principe involved in Jet propulsion?	Jet propulsion works on the principle of Newton's third law.	Understand	CO 3	CLO 12	ACE011.12

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2	What is the direction of plate for a stationery vertical plate after striking?	The jet of water after striking the plate will move along the direction of the plate.	Remember	CO 3	CLO 12	ACE011.12
3	What does Cv stand for in jet propulsion equation and define the same/	In a jet propulsion, Cv stands for velocity coefficient. It is defined as ratio of actual velocity to theoretical velocity.	Remember	CO 3	CLO 12	ACE011.12
4	What is the formula for force when jet of water strikes the flat fixed plate?	The formula for Force when it strikes the flat fixed plate is ρav^2	Remember	CO 3	CLO 13	ACE011.13
5	What is the formula for force when jet of water strikes the flat inclined plate?	The formula for force when it strikes the flat inclined plate is $\rho av^2 \sin\theta \times \cos\theta$.	Remember	CO 3	CLO 14	ACE011.14
6	What is the formula for force when jet of water strikes the fixed curved plate when the jet strikes at its center?	The formula for force when it strikes the fixed curved plate is - $\rho av^2 \sin\theta$	Remember	CO 3	CLO 13	ACE011.13
7	What is the formula for force when jet of water strikes the fixed curved symmetrical plate when the jet strikes at one tip?	The formula for force when jet of water strikes the fixed curved symmetrical plate when the jet strikes at one tip is **0**	Remember	CO 3	CLO 14	ACE011.14
8	What is the formula for force when jet of water strikes the fixed curved un - symmetrical plate when the jet strikes at one tip?	The formula for force when jet of water strikes the fixed curved un - symmetrical plate when the jet strikes at one tip is $\rho av^2 (\sin\theta - \sin\varphi)$	Remember	CO 3	CLO 14	ACE011.14
9	What is the angle of swing of the plate about hinge for the plate to remain in equilibrium condition?	The angle of swing of the plate about hinge for the plate to remain in equilibrium condition is $\sin\theta = \frac{\rho av2}{W}$	Remember	CO 3	CLO 12	ACE011.12
10	What is the formula for the force when jet of water strikes the moving flat plate?	The formula for the force when jet of water strikes the moving flat plate is $\rho a(V-u)^2$	Remember	CO 3	CLO 13	ACE011.13

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11	What is the formula for the force when jet of water strikes the moving inclined	The formula for the force when jet of water strikes the moving flat plate is F_x = **ρa X (V – u)^2 X Sin^{2}θ** F_y=**ρa X (V – u)^2 X SinθXCosθ**	Remember	CO 3	CLO 15	ACE011.15
12	What is the formula for the force in both directions when jet of water strikes the moving curved symmetrical plate?	The formula for the force when jet of water strikes the moving curved symmetrical plate is F_x =**ρa X (V – u)^2 X (1 + Cosθ)** F_y= **0**	Remember	CO 3	CLO 14	ACE011.14
13	What is the formula for the force in both directions when jet of water strikes the moving curved un - symmetrical plate at one end of tip?	The formula for the force in both directions when jet of water strikes the moving curved un - symmetrical plate at one end of tip is F_x =**ρa X V_{r1} X (V_{w1} ± V_{w2})** F_y= **0**	Remember	CO 3	CLO 15	ACE011.15
14	What is the formula for the force when jet of water strikes series of flat plates mounted on the runner?	The formula for the force when jet of water strikes series of flat plates mounted on the runner is F_x =**ρa X V X (V – u)** F_y= **0**	Remember	CO 3	CLO 12	ACE011.12
15	What is the value of maximum efficiency of the wheel when jet of water strikes series of flat plates mounted on the runner?	The value of maximum efficiency of the wheel when jet of water strikes series of flat plates mounted on the runner is **50 %**	Remember	CO 3	CLO 15	ACE011.15
MODULE-IV						
1	Define hydraulic turbines	Turbines are defined as the hydraulic machines which convert hydraulic energy into Mechanical energy.	Remember	CO 4	CLO 16	ACE011.16
2	What are the components of hydroelectric power plant?	The following are the components of hydroelectric power plant are A dam, pipes / penstocks, turbines and tail race.	Remember	CO 4	CLO 16	ACE011.16
3	Define gross head	It is defined as the difference between head race level and tail race level when no water is flowing. Denoted by Hg	Remember	CO 4	CLO 17	ACE011.17
4	Define net head	It is defined as the head available at the inlet of the turbine. It is also called as effective head. Mathematically, it is defined as: Hn = Hg - h_f	Remember	CO 4	CLO 17	ACE011.17

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5	Define hydraulic efficiency.	Ratio of the power delivered to runner and power supplied at inlet.	Remember	CO 4	CLO 17	ACE011.17
6	Define mechanical efficiency	Ratio of the power at the shaft of the turbine to power delivered by water to the runner.	Remember	CO 4	CLO 17	ACE011.17
7	Define volumetric efficiency.	Ratio of volume of water actually striking the runner to volume of water supplied to the turbine.	Remember	CO 4	CLO 18	ACE011.18
8	Define Overall efficiency	Ratio of power available at the shaft of the turbine to the power supplied by the water at the inlet of the turbine.	Remember	CO 4	CLO 18	ACE011.18
9	Classify the types of turbines based on the energy available at the inlet.	Based on the energy available at the inlet, turbines are classified as: i. Impulse turbine ii. Reaction turbine	Remember	CO 4	CLO 19	ACE011.19
10	Classify the types of turbines based on the direction of flow through runner.	Based on the types of turbines based on the direction of flow through runner, turbines are classified as: i. Tangential flow turbine ii. Radial flow turbine iii. Axial flow turbine iv. Mixed flow turbine.	Remember	CO 4	CLO 20	ACE011.20
11	Classify the types of turbines based on the head available at the inlet of the turbine.	Based on the head available at the inlet of the turbine, turbines are classified as: i. High head turbine ii. Low head turbine iii. Medium head turbine	Remember	CO 4	CLO 20	ACE011.20
12	Classify the types of turbines based on the Specific speed of the turbine.	Based on the Specific speed of the turbine, turbines are classified as: i. Low specific speed ii. Medium specific speed iii. High specific speed	Remember	CO 4	CLO 20	ACE011.20
13	What are the main components of Pelton wheel turbine?	Following are the major components of Pelton wheel turbine. i. Nozzle ii. Runner and buckets iii. Casing iv. Breaking jets	Remember	CO 4	CLO 20	ACE011.20
14	What are the main components of Francis turbine?	Following are the major components of Francis turbine. i. Casing ii. Guide mecahnisam iii. Runner and iv. Draft tube	Remember	CO 4	CLO 20	ACE011.20
15	What is the difference between Pelton Wheel turbine and Kaplan turbine.	In case of Peton wheel turbine, the plane of the runner is parallel to horizontal axis and while in the Kaplan turbine,the plain of the runner is parallel to perpendicular axis.	Remember	CO 4	CLO 20	ACE011.20

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MODULE-V						
1	What are the main parts of centrifugal pump.	Following are the main parts of the centrifugal pump. i. Impeller ii. Casing iii. Suction and Delivery pipe	Remember	CO 5	CLO 21	ACE011.21
2	Define suction head	It is the vertical height of the center line of the centrifugal pump above the water surface in the tank or pump from which water has to be lifted.	Remember	CO 5	CLO 21	ACE011.21
3	Define delivery head	The vertical distance between the center line of the pump and the water surface in the tank to which the water is delivered.	Remember	CO 5	CLO 21	ACE011.21
4	Define static head	The sum of suction head and delivery head is known as suction head.	Remember	CO 5	CLO 23	ACE011.23
5	Define manometric head	It is defined as the head against which a centrifugal pump has to work.	Remember	CO 5	CLO 21	ACE011.21
6	Define manometric efficiency	The ratio of manometric head to the head imparted by the impeller to the water is known as manometric efficiency.	Remember	CO 5	CLO 21	ACE011.21
7	Define mechanical efficiency	The ratio of the power available at the impeller to the power at the shaft of the centrifugal pump.	Remember	CO 5	CLO 22	ACE011.22
8	Define Overall efficiency	It is defined as the ratio of power output to the power input to the pump.	Remember	CO 5	CLO 23	ACE011.23
9	What is condition for minimum speed for starting centrifugal pump	If the pressure rise in the impeller is more than or equal to manometric head, then the centrifugal pump will start delivering water.	Remember	CO 5	CLO 23	ACE011.23
10	What are the functions of multi stage centrifugal pump	Following are the function of the multistage centrifugal pump. i. To produce high head ii. To discharge large quantity of liquid.	Remember	CO 5	CLO 23	ACE011.23
11	Define specific speed of a centrifugal pump.	The specific speed of a centrifugal pump is defined as the speed of a geometrically similar pump which would deliver one cubic meter of liquid per second per second against a head of one meter.	Remember	CO 5	CLO 21	ACE011.21
12	Define priming of a centrifugal pump	Priming of a centrifugal pump is defined as the operation in which the suction pipe, casing of the pump and a portion of the delivery pipe upto the delivery valve is completely filled up from outside source with the liquid to be raised by the pump before starting of the pump.	Remember	CO 5	CLO 22	ACE011.22

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13	What are the important characteristic curves for centrifugal pump?	Following are the important characteristic curves for centrifugal pump are: i. Main characteristic curve. ii. Operating characteristics curves iii. Constant efficiency or Muschel curves	Remember	CO 5	CLO 23	ACE011.23
14	Define cavitation	It is defined as the phenomenon of formation of vapour bubbles of a flowing liquid in a region where the pressure of the liquid falls below its vapour pressure and the sudden collapsing of these vapour bubbles in a region of higher pressure.	Remember	CO 5	CLO 24	ACE011.24
15	What are the effects of cavitation?	The following are the effects of cavitation: i. Metalic surfaces are damanged and cavities are formed. ii. Considerable noise and vibrations are produced. iii. Efficiency of the turbine, pumps decreases.	Remember	CO 5	CLO 24	ACE011.24

Signature of the Faculty **HOD, CE**