MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

Estd. 2000

IQAC

MUST KNOW CONCEPTS

MKC

CIVIL

2021-2022

Course Code & Course Name : 19CED07 / MECHANICS OF FLUIDS

Year/Sem/Sec : II/III

S.No	Term	Notation (Symbol)	Concept/Definition/Meaning/Units/Equation/ Expression	Units
	Subject		**MECHANICS OF FLUIDS**	
UNIT I FLUID PROPERTIES AND STATICS				
1	Fluid Mechanics	-	Fluid Mechanics is the branch of science which deals with the study of behavior of the fluids at rest as well as in motion	-
2	Mass Density	ρ	Mass of fluid /volume of fluid	Kg/m^3
3	Weight Density	W	Mass of fluid **x** acceleration ($\rho \times g$)	N/m^3
4	Weight Density of Water	W $_{water}$	1000×9.81	N/m^3
5	Specific Volume	v	volume of fluid / Mass of fluid	m^3/kg
6	Specific Gravity	S	Weight density of liquid/ Weight density of water.	No unit
7	Viscosity	μ	Resistance to the movement of one later of the fluid over the other adjacent layer of the fluid	-
8	Dynamic Viscosity	μ	The shear stress required to produce unit rate of shear deformation	N-s/m^2
9	Kinematic Viscosity	υ	The ratio between the dynamic viscosity and density of fluid	m^2/s
10	Control volume	V	A specified large number of fluid and thermal devices have mass flow in and out of a system	-
11	Compressibility	β	Compressibility is the reciprocal of the bulk modulus of elasticity	-
12	Surface Tension	σ	The tangential force per unit length acting at right angles on either side of the surface	N /m
13	Capillarity	Ө	It is the phenomenon of rise or fall of liquid surface relative to out side liquid surface	Degree
14	Total pressure	F	The force exerted by a static fluid on a surface either plane or a curved when the fluid comes in contact with the surfaces.	N/m^2

15	Center pressure	h*	The application of the total pressure on surface	N/m^2
16	Center of buoyancy	-	The point, through which the force of buoyancy is supposed to act.	-
17	Buoyancy	-	Body is immersed in a fluid, upward force equal to the weight of the fluid displaced by the body	-
18	Pressure Intensity	p	It is defined as the force acting per unit area.	N/m^2
19	Modulus Of Elasticity	K or E	Ratio of the stress applied to body or substance to the resulting strain within the elastic limit	N/mm^2
20	Work	W	A task or tasks to be undertaken	N-m or J
21	Energy	E	The strength and vitality required for sustained physical or mental activity	N-m or J
22	Power	P	The ability or capacity to do something or act in a particular way	watts
23	Specific weight	w	The force exerted by gravity on a unit volume of a fluid	N/m^3
24	Momentum	M	The quantity of motion of a moving body, measured as a product of its mass and velocity.	kg-m/s
25	Shear stress	τ	unit of load (or weight) divide by the unit of area	N/m^2

UNIT II - FLUID KINEMATICS AND DYNAMICS

26	Bernoulli's theorem	-	It states that in a steady, ideal flow of an incompressible fluid, the total energy at any point of the fluid is constant.	-
27	Pascal's law	-	The pressure or intensity of pressure at a point in a static fluid is equal in all direction	-
28	Hydrostatic law	-	The rate of increase of pressure in a vertically downward direction must be equal to the specific weight of the fluid at that point	-
29	Stream function	ψ	As the scalar function of space and time, such that its partial derivative with respect to any direction gives the velocity component at right angles to that direction	-
30	Velocity potential function	Φ.	Scalar function of space and time such that its negative derivative with respect to any direction gives the fluid velocity in that direction	-
31	Stream line	-	An imaginary line drawn through a flowing fluid in such a way that the tangent at any point on it indicates the velocity at that point.	-
32	Equipotential line	-	A line along which the velocity potential Φ is constant	-
33	Flow net	-	A grid obtained by drawing a series streamlines and equipotential lines	-
34	Meta centre	-	The point about which a body starts oscillating when the body is tilted by a small angle	-
35	Local acceleration	-	The rate of increase of velocity with respect to time at a given point in a flow field	-
36	Convective acceleration	-	The rate of change of velocity due to the change of position of fluid particle	-

			in a fluid flow.	
37	Venturimeter	-	Used for measuring the rate of flow of a fluid flowing through a pipe	-
38	Orifice meter	-	Device used for measuring the rate of flow of fluid through a Pipe. It is a cheaper device as compared to Venturimeter	-
39	Pitot tube	-	Used for measuring the velocity of flow at any point in a pipe or a channel.	-
40	Momentum equation	-	The net force acting on a fluid mass is equal to the change in momentum of flow per unit time in that direction	-
41	Angular deformation	-	The average change in the angle contained by two adjacent sides	-
41	Discharge	Q	Amount of fluid passing a section of a stream in unit time	m^3/s
42	Dynamics of fluid flow	-	The study of fluid motion with the forces causing flow	-
43	Compressible flow	-	The density of the fluid changes from point to point	-
44	Incompressible flow	-	The density is constant for the fluid flow	-
45	Rotational flow	-	The fluid particle flowing along streamlines	-
46	Irrotational flow		Fluid particle while flowing along stream lines, do not rotate about their own axis	
47	Velocity	v	A fluid effectively describes everything about the motion of a fluid	m/s
48	Angular velocity	ω	The rate of velocity at which an object or a particle is rotating around a center or a specific point in a given time period	rad/sec
49	Acceleration	a	The acceleration of a fluid particle is the rate of change of its velocity	m/s^2
50	Angular acceleration	α	A quantitative expression of the change in angular velocity that a spinning object undergoes per unit time	

UNIT III FLOW THROUGH PIPES

51	Viscous flow	-	Flow is said to be viscous if the Renold's number is less than 2000 (or) the flows inlayers i.e. Re <2000	
52	Kinetic energy correction factor	α	the ratio of the kinetic energy of the flow per sec based on actual velocity across a section to the kinetic energy of the flow per sec based on average velocity across the same section	
53	Momentum correction factor	β	the ratio of momentum of the flow per sec based on actual velocity to the momentum of the flow per sec based on average velocity across the section	
54	Laminar Flow	-	A flow is said to be laminar if Renolds number is less than 2000 is known as Laminar flow	

3

55	Turbulent Flow	-	A flow is said to be laminar if Renolds number is greater than 4000 is known as Turbulent flow	
56	Hydraulic gradient line	HGL	The line which gives the sum of pressure head and datum head of a flowing fluid in a pipe with respect the reference line	
57	Total energy line	TEL	The line which gives the sum of pressure head , datum head and kinetic head of a flowing fluid in a pipe with respect to some reference line	
58	Sypon	-	Sypon is along bend pipe which is used to transfer liquid from a reservoir at a higher elevation to another reservoir at a lower level	-
59	Major losses in a pipe	-	Losses in a pipe is mainly due to the frictional resistance caused by the shear force between the fluid particles and boundary walls	-
60	Minor losses in a pipe	-	Head due to change of velocity of the flowing fluid in magnitude or direction.	-
61	Co-efficient of friction	-	Ratio of actual discharge to theoretical discharge of the pipe	-
62	Equivalent pipeline	-	Consisting of several pipes of different lengths and diameters	-
63	Loss of head due to friction in pipes	h_f	$h_f = \dfrac{4FLV^2}{2gD}$	-
64	Sudden enlargement of the pipe	he	$he = \dfrac{(V_1-V_2)^2}{2g}$	-
65	Sudden contraction of the pipe	hc	$hc = \dfrac{0.5\ V^2}{2g}$	-
66	Entrance of the pipe	h_i	$h_i = \dfrac{0.5V_2}{2g}$	-
67	Expression for drop of pressure	P1-P2	$P_1-P_2 = \dfrac{32\ \mu \bar{U}L}{\rho g D}$	-
68	Hydraulic mean depth	M	$m = \dfrac{A}{P}$	-
69	Gravity	g	An object is the ratio between the density of an object to a reference liquid	m/s_2
70	Discharge	Q	The amount of fluid passing a section of a stream in unit time is called the discharge	m_3/s
71	Force	F	Force represents as a vector, which means it has both magnitude and direction.	N (kg.m /s2)
72	Weight	W	Force exerted by gravity on a unit volume of a fluid.	N (kg.m /s2)
73	Torque	T	A force that tends to cause rotation	N-m or J
74	Laminar Flow	Re	Re < 2000	-

75	Turbulent Flow	Re	Re > 4000	-
UNIT IV BOUNDARY LAYER				
76	Boundary layer	-	A real fluid flow passed a solid boundary, fluid layer is adhered to the solid boundary.	-
77	Boundary layer growth	-	Subsequent points downstream of the leading edge, the boundary layer region increases because the retarded fluid is further retarded.	-
78	Turbulent boundary	-	Downstream of transition zone, the boundary layer is turbulent and continuous to grow in thickness.	-
79	Viscous flow	-	Renold"s number is less than 2000	cm^2
80	Kinetic energy correction factor	A	The ratio of the kinetic energy of the flow per sec based on actual velocity across a section to the kinetic energy of the flow per sec based on average velocity across the same section	-
81	momentum correction factor	B	the ratio of momentum of the flow per sec based on actual velocity to the momentum of the flow per sec based on average velocity across the section	-
82	Turbulent Flow	-	Renolds number is greater than 4000	-
83	Displacement thickness	$\delta*$	distance by which the boundary should be displaced to compensate for the reduction in flow rate of boundary layer formation	-
84	Momentum thickness	θ	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	-
85	Energy thickness	$\delta**$	The distance by which the boundary should be displaced to compensate for the reduction in kinetic energy of the flowing fluid on account of boundary layer formation.	-
86	Chezy's formula	-	$V = C\sqrt{mi}$	-
87	Laminar sub Layer	-	In the turbulent boundary layer zone, adjacent to the solid surface of the plate the velocity variation is influenced by viscous effects.	-
88	Causes boundary layer	-	Aerodynamic forces are generated between the fluid and the object	-
89	Importance of boundary layer	-	Boundary layer can reduce the transfer of heat, CO_2 and water vapor from the leaf to the environment.	-
90	Types of drag	-	parasite drag: form drag, interference drag	-
91	Force lift	-	The lift force, lifting force or simply lift is the sum of all the forces on a body that force it to move perpendicular to the direction of flow.	-
92	Circulation	-	The line intergral of the velocity along a closed path	-

5

93	Point separation	-	Separation point is the point where the air stops "sticking" to an object that is moving through the air.	-
94	Displacement thickness	$\delta*$	$\delta^* = \int_0^\delta \left(1 - \frac{u}{U}\right) dy.$	-
95	Momentum thickness	θ	$\theta = \int_0^\delta \frac{u}{U}\left[1 - \frac{u}{U}\right] dy.$	-
96	Energy thickness	$\delta**$	$\delta^{**} = \int_0^\delta \frac{u}{U}\left[1 - \frac{u^2}{U^2}\right] dy.$	-
97	Von Karman momemtum equation	-	$\frac{\tau_0}{\rho U^2} = \frac{\partial \theta}{\partial x}$	-
98	Examples laminar flow	-	Flow of oil in measuring instruments, Rise of water in plants through their roots etc.,	-
99	characteristics of laminar flow	-	No slip at the boundary,The flow is rotational.	-
100	Boundary layer thickness	-	Velocity of the fluid is approximately equal to 0.99 times the free stream velocity of the fluid.	-
UNIT V SIMILITUDE AND MODEL STUDY				
101	Dimensional analysis	-	Mathematical technique which makes use of the study of dimensions as an aid to solution of several engineering problems	-
102	Dimensional homogeneity	-	An equation is said to be dimensionally homogeneous if the dimensions of the terms on its LHS are same as the dimensions of the terms on its RHS	-
103	Buckingham's π theorem	-	If there are n variables in a physical phenomenon and if these variables contain m functional dimensions and are related by a dimensionally homogeneous equation,	-
104	Model	-	The small scale replica of an actual structure or the machine	-
105	Prototype.	-	The actual structure or machine	-
106	Scale Ratio	-	It exists between the model and prototype if the ratio of corresponding lengths, dimensions in the model and the prototype are equal	-
107	Dynamic similarity	-	The similarity of forces at corresponding points in the model and prototype is equal.	-
108	Dimensionless numbers	-	The numbers obtained by dividing inertia force or gravity force or pressure force or elastic force or surface tension	-
109	Elastic force	-	The product of elastic stress and the area of flowing fluid.	-
110	Reynold's number	Re	The ratio of inertia force of flowing fluid and viscous force of the fluid	-

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111	Froude's number	Fe	Sare root of ratio of inertia force of flowing fluid to gravity	-
112	Distorted model	-	distorted model only when it is not geometrically similar to prototype	-
113	Undistorted model	-	If the scale ratio for the linear dimensions of the model and prototype is same	-
114	Area	A	The quantity that expresses the extent of a two-dimensional figure or shape or planar lamina, in the plane	m^2
115	Volume	V	The amount of space that a substance or object occupies, or that is enclosed within a container.	m^3
116	Moment of inertia	I	The inertia of a rigid rotating body with respect to its rotation".	$m4$
117	Viscosity	μ	$ML^{-1}T^{-1}$	kg/ms
118	Density	ρ	ML^{-3}	kg/m^3
119	Bulk Modulus	K	$ML^{-1}T^{-2}$	kg/ms_2
120	Energy	E	ML^2T^{-2}	N.m
121	Power	P	$ML^{-2}T^{-2}$	kW
122	Mass	M	M	kg
123	Momentum	M	MLT^{-1}	kg/ms
124	Torque	T	ML^2T^{-2}	N.M
125	Discharge	Q	L^3T^{-1}	m^3/s

Subject	GENERAL AND APTITUDE			
S.No	**Term**	**Notation (Symbol)**	**Concept/Definition/Meaning/Units/Equation/Expression**	**Units**
1.	Which number should come next in the series, 48, 24, 12,......		6	
2.	Which number would fill the empty space in the series; 4, 7, 12, 19, _, 39?		28	
3.	Pointing to a photograph, a man said, "I have no brother, and that man's father is my father's son." Whose photograph was it?		His son	
4.	A mother is twice as old as her son. If 20 years ago, the age of the mother was 10 times the age of the son, what is the present		45 years	years

	age of the mother?			
5.	If January 1, 1996, was Monday, what day of the week was January 1, 1997?		Wednesday	
6.	How many times the hands of a clock coincide in a day?		22	
7.	A shopkeeper sold an article for Rs. 2500. If the cost price of the article is 2000, find the profit percent.		25%	%
8.	A running man crosses a bridge of length 500 meters in 4 minutes. At what speed he is running?		7.5 km/s	km/s
9.	A train moving at speed of 80 km/hr crosses a pole in 7 seconds. Find the length of the train.		175 m	m
10.	Which cricketer has become the fastest cricketer to score 7,000 Test runs?		Steve Smith	
11.	Anandan Gunasekaran, who was in news recently is associated with which sport?		Para-athletics	
12.	Who among the following has won the Davis Cup title 2019?		Rafael Nadal	
13.	Pooja Gehlot is associated with which sport?		Wrestling	
14.	The newly discovered spider species named after which cricketer?		Sachin Tendulkar	
15.	On a certain Principal if the Simple interest for two years is Rs 2400 and Compound interest for the two years is Rs 2544, what is the rate of Interest?		12 percent	
16.	What will the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years.		2 : 3	
17.	If p is prime number, then which of the following		(p -2)	

	may also be a prime number?			
18.	What is the greatest number that will divide 1204, 3664 and 5904 leaving the same remainder?		20	
19.	The arithmetic mean of two numbers is 30 and their geometric mean is 24. What is the value of larger number?		48	
20.	What is the least value of K so that the number 6735K1 is divisible by 9?		5	
21.	Five-eight of three-tenth of four-ninth of a number is 60. What is the number?		720	
22.	Sum of a fraction and thrice its reciprocal is 31/6. What is the fraction?		9/2	
23.	How is the word "people" coded?		ch	
24.	How is the word "follow" is coded?		gi	
25.	When was the Institute for Defence Studies and Analyses (IDSA) established?		1965	

Faculty Team Prepared   **Signatures**

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