University of Mumbai
Examination 2021 under cluster __ (Lead College: __KJSIEIT_____)
Examinations Commencing from 1 June 2021
Program: **Civil Engineering**
Curriculum Scheme: Rev - 2019
Examination: SE Semester IV
Course Code: CEC 405 and Course Name: Fluid Mechanics 2

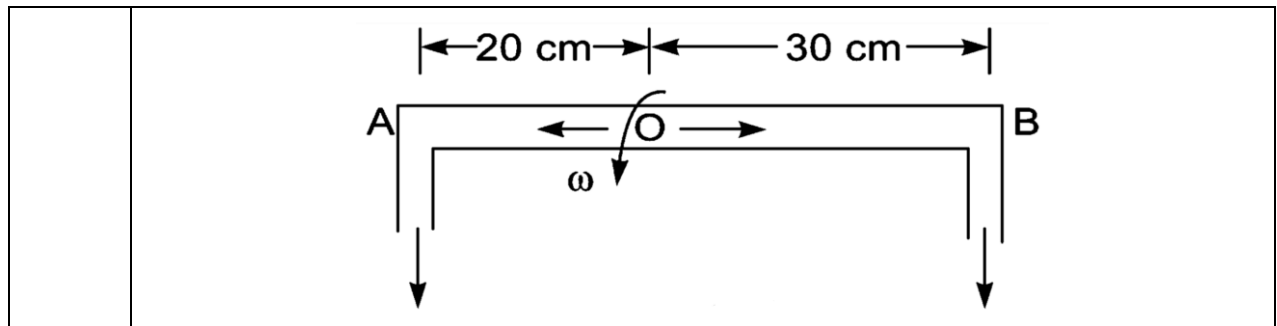Time: 2 hour   Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1	Major losses in a flow through pipe are due to:
Option A:	Sudden expansion
Option B:	Exit
Option C:	Gradual bend in pipe
Option D:	Friction
2	What is the meaning of (du/dy) in the equation $\tau = \mu \dfrac{du}{dy}$
Option A:	change in horizontal distance with velocity
Option B:	change in velocity with vertical distance
Option C:	change in velocity with change in vertical distance
Option D:	change in vertical distance with change in velocity
3	For a smooth boundary for a turbulent flow in a pipe $\dfrac{k}{\delta'}$ value should be:
Option A:	equal to 0.25
Option B:	equal to 6
Option C:	more than 6
Option D:	less than 0.25
4	When the axis of the body is parallel to the direction of the fluid flow,
Option A:	Drag force is zero
Option B:	Lift force is maximum
Option C:	Lift force is zero
Option D:	Drag force is maximum
5	When Reynold's Number is 4023, the flow is:
Option A:	Transitional
Option B:	Laminar

Option C:	Turbulent
Option D:	Mixed
6	F.dt = d(mv) is called as,
Option A:	Impulse momentum equation
Option B:	Darcy Weisbach equation
Option C:	Momentum Thickness equation
Option D:	Moment of momentum equation
7	The distance from the boundary of a solid body measured in y-direction to the point, where the velocity of the fluid is approximately equal to 0.99 times the free stream velocity (U) of the fluid is called as:
Option A:	Laminar Sub-layer
Option B:	Transitional layer
Option C:	Turbulent layer
Option D:	Boundary layer
8	In water hammer phenomenon, valve is said to be suddenly closed when,
Option A:	T < 2L/C
Option B:	T > 2L/C
Option C:	2T > L/C
Option D:	L > 2T/C
9	Rayleigh's method for determining expression for a variable is used when the variable is:
Option A:	dependent on more than 4 variables
Option B:	dependent on 10 to 11 variables
Option C:	dependent on up to 3 to 4 variables
Option D:	dependent on 22 to 23 variables
10	Which are the following are fundamental dimensions useful in Fluid Mechanics of Civil Engineering?
Option A:	Temperature, Dynamic viscosity, Length
Option B:	Length, Temperature, Time
Option C:	Length, Mass, Time
Option D:	Density, Mass, Dynamic viscosity
11	Hydraulic Gradient Line is:
Option A:	equal to total head minus kinetic head
Option B:	equal to total head plus kinetic head
Option C:	equal to kinetic head plus datum head
Option D:	equal to pressure head plus kinetic head

12	What are the dimensions of kinematic viscosity?
Option A:	$M^2 L^{-1} T^3$
Option B:	LT^{-2}
Option C:	$L^2 T^{-1}$
Option D:	$T^2 L$
13	What is the ratio of Maximum velocity and the average velocity for a laminar flow between two parallel plates when both plates are at rest?
Option A:	0.50
Option B:	0.67
Option C:	1.50
Option D:	2.50
14	The moment of momentum equation is used for
Option A:	water hammer phenomenon
Option B:	design of syphon pipe system
Option C:	studying drag and lift forces
Option D:	analysis of flow problems in turbines and centrifugal pumps
15	In an equivalent pipe, Dupuit's equation is given by:
Option A:	$\dfrac{L}{d} = \dfrac{L_1}{d_1^5} + \dfrac{L_2}{d_2^5} + \dfrac{L_3}{d_3^5}$
Option B:	$\dfrac{L}{d^5} = \dfrac{5L_1}{d_1^5} + \dfrac{5L_2}{d_2^5} + \dfrac{5L_3}{d_3^5}$
Option C:	$\dfrac{L}{d^5} = \dfrac{L_1}{d_1^5} + \dfrac{L_2}{d_2^5} + \dfrac{L_3}{d_3^5}$
Option D:	$\dfrac{5L}{d^5} = \dfrac{L_1}{d_1^5} + \dfrac{L_2}{d_2^5} + \dfrac{L_3}{d_3^5}$
16	A flat plate 1.5 m x 1.5 m moves at 50km/hour in stationary air of density 1.15kg/m3. If the co-efficients of drag and lift are 0.15 and 0.75, respectively, what are the values of: 1]. The lift force, 2]. The drag force.
Option A:	187.20N, 37.44N respectively
Option B:	165.23N, 54.23N respectively
Option C:	123.87N, 76.21N respectively
Option D:	398.67N, 45.98N respectively
17	For 3 pipes connected in series, the total head loss (H) will be:
Option A:	Head loss in pipe 1-Head loss in pipe 2+Head loss in pipe 3
Option B:	Head loss in pipe 1+Head loss in pipe 2+Head loss in pipe 3
Option C:	Head loss in pipe 2+Head loss in pipe 3-Head loss in pipe 1
Option D:	Head loss in pipe 3+Head loss in pipe 1-Head loss in pipe 2

18	A pipe-line carrying water has an average height of irregularities projecting from the surface of the boundary of the pipe as 0.15mm. The shear stress developed is 4.9 N/m2. The kinematic viscosity of water is 0.01 stokes. What type of boundary is it?
Option A:	Transitional
Option B:	Smooth
Option C:	Rough
Option D:	Mixed
19	What is the name of the given equation $\dfrac{p_1 - p_2}{\rho g} = h_f = \dfrac{32\mu \bar{u} L}{\rho g D^2}$
Option A:	Euler's equation
Option B:	Bernoulli's equation
Option C:	Navier Stokes equation
Option D:	Hagen Poisueilli's equation
20	What is the condition of maximum power transmission through a nozzle?
Option A:	H = hf/3
Option B:	H+hf = 3
Option C:	hf = H-3
Option D:	hf = H/3

Q2.	Solve any Two Questions out of Three 10 marks each
A	A horizontal pipeline 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank 10m above the center of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f = 0.01 for both sections of the pipe. Draw HGL and TEL.
B	A man weighing 100 kgf descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The velocity with which the parachute, which is hemispherical in shape, comes down is 25m/s. Find the diameter of the parachute. Assume C_D= 0.5 and density of air = 1.25 kg/m^3.
C	A lawn sprinkler with two nozzles of diameter 5mm each is connected across a tap of water as shown in the given figure. The nozzles are at a distance of 30cm and 20cm from the center of the tap. The rate of flow of water through tap is 120cm^3/s. The nozzles discharge water in the downward direction. Determine the angular speed at which the sprinkler will rotate free.

Q3.	Solve any Two Questions out of Three 10 marks each
A	For a laminar flow through circular pipe, prove that the ratio of maximum velocity to the average velocity is equal to 2.
B	A rough pipe is of diameter 10cm. The velocity at a point 4 cm from the wall is 30% more than the velocity at a point 2cm from the pipe wall. Determine the average height of roughness.
C	Three reservoirs A, B and C are connected by a pipe system as shown in the following figure. Find the discharge into or from reservoir B and C if the rate of flow from reservoir A is 60 liters/s. Find the height of water level in the reservoir C. Take f = 0.006 for all pipes.