

University of Mumbai
Examination June 2021

Examinations Commencing from 1st June 2021

Program: Civil Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: CE-C405 and Course Name: Fluid Mechanics-II

Time: 2-hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	A liquid flow through pipes 1 and 2 with the same flow velocity. If the ratio of their pipe diameters $d_1 : d_2$ be 3:2, what will be the ratio of the head loss in the two pipes?
Option A:	3:2
Option B:	9:4
Option C:	2:3
Option D:	4:9
2.	Coefficient of friction of a laminar flow is
Option A:	$R_e/16$
Option B:	$R_e/64$
Option C:	$16/R_e$
Option D:	$64/R_e$
3.	The stagnation state is obtained after a _____ to zero velocity.
Option A:	Accelerating
Option B:	Decelerating
Option C:	Equilibrium
Option D:	Exponential increase
4.	The vertical intercept between EGL and HGL is equal to
Option A:	Pressure head
Option B:	Potential head
Option C:	Kinetic head
Option D:	Piezometric head
5.	A liquid flow through two similar pipes 1 and 2. If the ratio of their flow velocities $v_1 : v_2$ be 2:3, what will be the ratio of the head loss in the two pipes?
Option A:	3:2
Option B:	9:4
Option C:	2:3
Option D:	4:9

6.	What is the total loss developed in a series of pipes?
Option A:	Sum of losses in each pipe only
Option B:	Sum of local losses plus the losses in each pipe
Option C:	Sum of local losses only
Option D:	Zero
7.	For a nozzle, the vertical intercept between Energy Gradient Line and Hydraulic Gradient Line
Option A:	increases
Option B:	remains constant
Option C:	decreases
Option D:	initially increases then stagnant
8.	What is the function of a surge tank?
Option A:	It causes water hammer
Option B:	Produces surge in the pipeline
Option C:	Relieves water hammer
Option D:	Supplies water at constant pressure
9.	For a 2-D flow, what is the mixing length of the mixing layer turbulence model?
Option A:	0.1 of layer width
Option B:	0.07 of layer width
Option C:	0.08 of layer width
Option D:	0.09 of layer width
10.	The Reynolds number is found out for a flow in a circular pipe. This circular pipe is moulded into a square pipe, keeping length of the pipe same. Ignore the thickness of the pipe. The Reynolds number changes by
Option A:	57% increase
Option B:	57% decrease
Option C:	43% decrease
Option D:	43% increase
11.	Local skin friction coefficient is given by
Option A:	$0.646 / (\text{Re})^{1/2}$
Option B:	$1.646 / (\text{Re})^{1/2}$
Option C:	$2.646 / (\text{Re})^{1/2}$
Option D:	$3.646 / (\text{Re})^{1/2}$
12.	The Prandtl Number approximates
Option A:	Thermal diffusivity to momentum diffusivity
Option B:	Shear stress to thermal diffusivity
Option C:	Thermal diffusivity to kinematic viscosity
Option D:	Momentum diffusivity to thermal diffusivity
13.	Change in momentum is
Option A:	the result of powers acting on the surface of the control volume
Option B:	the result of works acting on the surface of the control volume
Option C:	the result of forces acting on the surface of the control volume
Option D:	the result of stresses acting on the surface of the control volume

14.	Velocity defect in boundary layer theory is defined as
Option A:	The error in the measurement of velocity at any point in the boundary layer
Option B:	The difference between the velocity at a point within the boundary layer and the free stream velocity
Option C:	The difference between the velocity at any point within the boundary layer and the velocity near the boundary
Option D:	The ratio between the velocity at a point in the boundary layer and the free stream velocity
15.	The drag coefficient is directly proportional to the
Option A:	Area
Option B:	Mass density
Option C:	Drag force
Option D:	Flow speed
16.	Bodies with a larger cross section will have
Option A:	Lower drag
Option B:	Higher drag
Option C:	Same drag
Option D:	No drag
17.	When a bullet hits a solid block and gets embedded into it. What is conserved?
Option A:	Momentum only
Option B:	Kinetic energy only
Option C:	Momentum and kinetic energy
Option D:	Mass
18.	Speed of sound in an ideal gas depends on
Option A:	Temperature and pressure
Option B:	Surface area and volume
Option C:	Temperature and composition
Option D:	Composition and surface area
19.	What happens to velocity in the converging duct of nozzle?
Option A:	Increases
Option B:	Decreases
Option C:	Same
Option D:	Independent
20.	How do we calculate losses for a larger range of Reynolds number?
Option A:	Moody chart
Option B:	Bar chart
Option C:	Scatter chart
Option D:	Column histogram

Q 2	Solve any Four out of Six	5 marks each.
A	Three pipes of length 800m, 500m and 400m and of diameters 500mm, 400mm and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe.	
B	Find the maximum power transmitted by a jet of water discharging freely out of nozzle fitted to a pipe = 300m long and 100mm diameter with coefficient of friction as 0.01. The available head at the nozzle is 90m.	
C	Explain major loss and Minor loss	
D	Derive Dupit's equation loss	
E	Explain working principle working of syphon	
F	Explain hydrodynamically Smooth and Rough boundary	

Q 3	Solve any Four out of Six	5 marks each.
A	<p>The rate of flow of water through a horizontal pipe is $0.25\text{m}^3/\text{s}$. The diameter of the pipe which is 200mm is suddenly enlarged to 400mm. The pressure intensity of the smaller pipe is $11.772\text{N}/\text{cm}^2$. Determine:</p> <ol style="list-style-type: none"> Loss of head due to sudden enlargement Pressure intensity in the large pipe <p>Power lost due to enlargement</p>	
B	Derive Von Karman momentum integral equation for boundary layer flows.	
C	<p>Calculate :</p> <ol style="list-style-type: none"> The pressure gradient along flow, The average velocity, and <p>The discharge for an oil of viscosity $0.02\text{Ns}/\text{m}^2$ flowing between two stationary parallel plates 1m wide is 10mm apart. The velocity midway between the plates is 2m/s.</p>	
D	Derive Darcy Weisbach Equation	
E	A syphon of diameter 200mm connects two reservoirs having a difference in elevation of 15m. The total length of the syphon is 600m and the summit is 4m above the water level in the upper reservoir. If the separation takes place at 2.8m of water absolute, find the maximum length of syphon from upper reservoir to the summit. Take $f= 0.004$ and atmospheric pressure = 10.3m of water.	
F	Explain Prandtl mixing length theory for turbulent shear stress and Karman-Prandtl velocity distribution in turbulent flow in pipes.	