QP- 93293

University of Mumbai
Examination summer 2022
Program: Mechanical
Curriculum Scheme: REV- 2019 'C' Scheme
Examination: SE Semester: IV
Course Code: 402 and Course Name: Fluid Mechanics

20/5/2022

Time: 3 hour

Max. Marks: 80

| Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The viscosity of liquids ……… With increase in temperature.
Option A:	decreases
Option B:	increases
Option C:	first decreases and then increases
Option D:	first increases and then decreases
2.	Find Reynolds number if velocity of fluid is 2 m/s and density of fluid 800 kg/m^3 and Viscosity 0.2 N.s/m^2 is flowing through 0.25 m diameter pipe.
Option A:	2000
Option B:	200
Option C:	20
Option D:	2
3.	………… is the square root of the ratio of the inertia force to the pressure force.
Option A:	Reynolds number
Option B:	Mach's number
Option C:	Euler's number
Option D:	Froude's number
4.	The term $V^2/2g$ is known as
Option A:	Potential energy
Option B:	pressure energy
Option C:	kinetic energy per unit weight
Option D:	kinetic energy
5.	Which property of the fluid accounts for the major losses in pipes?
Option A:	Density
Option B:	Specific gravity
Option C:	Viscosity
Option D:	Compressibility
6.	If liquid has specific gravity 0.2, then what is weight density of the liquid?
Option A:	200 N/m^3
Option B:	2000 N/m^3
Option C:	1962 N/m^3
Option D:	1.962 N/m^3
7.	The Reynolds transport theorem establishes a relationship between _____ and _____
Option A:	Control mass system, Control volume system
Option B:	Differential equation, Integral equation
Option C:	Non-conservative equation, Conservative equation

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Option D:	Substantial derivative, Local derivative
8.	The coefficient of discharge of Venturimeter lies within the limits:
Option A:	0.95 to 0.99
Option B:	0.8 to 0.85
Option C:	0.7 to 0.8
Option D:	0.6 to 0.7
9.	The maximum velocity in a circular pipe when flow is laminar occurs at
Option A:	the top of the pipe
Option B:	the bottom of the pipe
Option C:	the centre of the pipe
Option D:	not necessarily at the centre
10.	What is the graph that is represented in the airfoil section?
Option A:	Lift-moment ratio
Option B:	Coefficient of lift-coefficient of drag ratio
Option C:	Angle of attack-drag ratio
Option D:	Lift–angle of attack ratio

Q2.	
A	Solve any Two 5 marks each
i.	What is Pascal law and Archimedes Principle?.
ii.	How do you determination of head loss in pipes due to friction
iii.	Write short notes on types of fluids.
B	Solve any One 10 marks each
i.	A 1 m wide and 1.5 m deep rectangular plane surface lies in water in such a way that its plane makes an angle of 30° with the free water surface. Determine the total pressure and position of centre of pressure when the upper edge is 0.75 m below the free water surface.
ii.	In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = - y - 4x$. Show that velocity potential exists and determine its form as well as stream function.

Q3.	
A	Solve any Two 5 marks each
i.	What are the properties of Newtonian and non-Newtonian fluids?
ii.	With neat sketch explain working and construction of venturimeter
iii.	Write a short note on Buckingham's π theorem.
B	Solve any One 10 marks each
i.	Determine the flow rate through the Venturimeter shown in figure ($\gamma = \rho g$)

$p_1 = 735$ kPa
$p_2 = 550$ kPa
Q
31 mm
19 mm
$\gamma = 9.1$ kN/m³
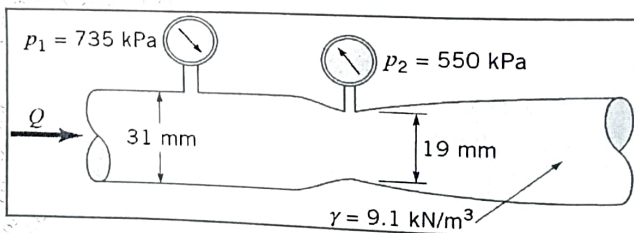
ii. Find the magnitude and direction of the resultant water pressure acting on a curved face of a dam which is shaped according to the relation $y = (x^2/8)$ as shown in fig. The height of the water retained by the dam is 10 m. Consider the width of the dam as unity.

WATER LEVEL

Dam

10 m
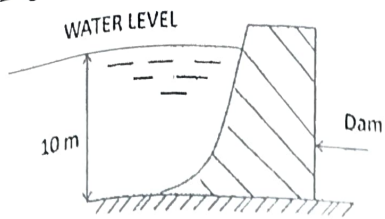
Q4.

A Solve any Two   **5 marks each**

i. What is Reynolds transport theorem? What purpose does it serve?

ii. Define stream function and velocity potential function.

iii. Write short note on boundary layer separation and methods to control it

B Solve any One   **10 marks each**

i. An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 mm diameter. If the pressure drop in 100 m length of the pipe is 1800 kN/m^2 determine the rate of flow of oil.

ii. Water (ρ= 999.7 kg/m3 and μ=1.307 x10-3 kg/m.s) is flowing in a 0.20-cm-diameter 15-m-long pipe steadily at an average velocity of 1.2 m/s.

Determine

(a) the pressure drop and

(b) The pumping power requirement to overcome this pressure drop

Water

1.2 m/s

$D = 0.2$ cm

$L = 15$ m