

				Sub	ject	Coc	de: I	3CE	303
Roll No:									

BTECH (SEM III) THEORY EXAMINATION 2024-25 FLUID MECHANICS

TIME: 3 HRS M.MARKS: 70

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

 $2 \times 07 = 14$

Printed Page: 1 of 2

Q no.	Question	CO	Level
a.	What is buoyancy?	CO1	K2
b.	Define Newtonian and Non-Newtonian fluids.	CO1	K2
c.	Differentiate between Compressible and incompressible flow.	CO2	K2
d.	Define velocity potential function.	CO2	K2
e.	Define vena-contracta.	CO3	K2
f.	What do you mean by eddy viscosity?	CO4	K2
g.	What is Magnus effect?	CO5	K2

SECTION B

2. Attempt any *three* of the following:

 $07 \times 3 = 21$

Q no.	Question	CO	Level
a.	Explain the working principle of a U-tube manometer. How is it used	CO1	K2
	to measure pressure in a fluid?		,
b.	Define subsonic, sonic, and supersonic flows. What are the	CO2	K2
	characteristics and applications of each type of flow?	(5)	
c.	Explain the classification of orifices and mouthpieces based on their	CO ₃	K2
	shape, size, and sharpness?		
d.	Derive an expression for the loss of head due to friction in pipes.	CO4	K3
e.	Explain the advantages and limitations of CFD compared to	CO5	K2
	experimental methods in fluid dynamics research and engineering		
	design.		

SECTION C

3. Attempt any *one* part of the following:

 $07 \times 1 = 07$

Q no.	Question	CO	Level
a.	The space between two square flat parallel plates is filled with oil. Each	CO1	K3
	side of theplate is 60 cm. The thickness of the oil film is 12.5 mm. The		
	upper plate, which moves at 2.5 meter persec requires a force of 98.1 N		
	to maintain the speed. Determine:		
	(i) the dynamic viscosity of the oil in poise, and		
	(ii) the kinematic viscosity of the oil in stokes if the specific gravity of		
	the oil is 0.95.		
b.	A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The	CO1	K3
	depth ofimmersion of the pontoon is 0.80 m in sea water. If the centre		
	of gravity is 0.6 m above the bottom of the pontoon, determine the		
	meta-centric height. The density for sea water = 1025 kg/m^3 .		

				Sub	ject	Coc	de: I	SCE	303
Roll No:									

BTECH (SEM III) THEORY EXAMINATION 2024-25 FLUID MECHANICS

TIME: 3 HRS M.MARKS: 70

4. Attempt any *one* part of the following:

 $07 \times 1 = 07$

Printed Page: 2 of 2

Q no.	Question	CO	Level
a.	What is the irrotational velocity field associated with the potential	CO2	K3
	$\varphi = 3x^2 - 3x + 3y^2 + 16t^2 + 12zt.$		
	Does the flow field satisfy the incompressible continuity equation?		
b.	If for a two-dimensional potential flow, the velocity potential is given	CO2	K3
	by $\varphi = x (2y - 1)$, determine the velocity at the point P (4, 5). Determine		
	also the value of stream function yat the point P.		

5. Attempt any *one* part of the following:

 $07 \times 1 = 07$

Q no.	Question	CO	Level
a.	What is Euler's equation of motion? How will you obtain Bernoulli's	CO3	K3
	equation from it?		
b.	A pipeline carrying oil of specific gravity 0.87, changes in diameter	CO3	K3
	from 200 mm diameter at a position A to 500 mm diameter at a		
	position B which is 4 meters at a higher level. If the pressures at A and		.1
	8 are 9.81 N/cm ² and 5.886 N/cm ² respectively and the discharge is		1
	200 liters/s determine the loss of head and direction of flow.		6.

6. Attempt any *one* part of the following:

 $0.7 \times 1 = 0.7$

Q no.	Question	CO	Level
a.	For Laminar flow of an oil having dynamic viscosity $\mu = 1.766$ Pa.s in	CO4	K3
	a 0.3 m diameter pipe, the velocity distribution is parabolic with a		
	maximum point velocity of 3 m/s at the centre of the pipe. Calculate		
	the shearing stresses at the pipe wall and within the fluid 50 mm from		
	the pipe wall.		
b.	Derive an expression for the velocity distribution for viscous flow	CO4	K3
	through a circular pipe. Alsosketch the distribution of velocity and		
	shearstress across a section of the pipe.		

7. Attempt any one part of the following:

 $07 \times 1 = 07$

Q no.	Question	CO	Level
a.	Draw and explain the approximate flow pattern and the pressure	CO5	K3
	distribution around a flat plate placed perpendicularly in a stream flow.		
b.	Calculate the total drag, shear drag and the pressure drag exerted on 1m	CO5	K3
	length of an infinitecircular cylinder which has a diameter equal to 30		
	mm, air of density 1.236 kg/m ³ flowing past the cylinder withvelocity		
	3.6 m per minute. Take total drag coefficient equal to 1.4 and shear		
	drag coefficient equal to 0.185.		