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Enrollment No.....



Faculty of Engineering
End Sem Examination Dec 2024
CE3CO19 Fluid Mechanics

Programme: B. Tech.

Branch/Specialisation: CE

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

		Marks	BL	PO	CO	PSO
Q.1 i.	A fluid with viscosity that we encounter in everyday life, such as water and oil is called: (a) Ideal fluid (b) Newtonian fluid (c) Real fluid (d) Incompressible fluid	1	1	1, 2	1	
ii.	The number of cubic meters occupied by one kilogram of a particular substance can be defined as: (a) Specific weight (b) Specific density (c) Specific gravity (d) None of these	1	1	1, 2	1	
iii.	Construction of a _____ is often used for solving groundwater flow problems where the geometry makes analytical solutions impractical. (a) Stream function (b) Flow net (c) Flow channel (d) Flow chart	1	1	1, 2	1	
iv.	The measure of how a fluid rotates, or twists is called as: (a) Vorticity (b) Circulation (c) Velocity potential (d) All of these	1	1	1, 2	1	
v.	Which of the following is a dimensionless quantity? (a) Strain (b) Stress (c) Specific gravity (d) Length	1	1	1, 2	1	

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vi.	A dimension which is not dependent upon any other dimension's unit is called as: (a) Dependent dimension (b) Independent dimension (c) Fundamental dimension (d) Absolute dimension	1	1	1, 2	1
vii.	If a square pipe of side 90 cm. carries a discharge of 5 m ³ /s, the velocity (m/s) in the pipe is: (a) 0.162 (b) 4.05 (c) 6.17 (d) Can't be determined	1	1	1, 2	1
viii.	Head loss in turbulent flow in a pipe is: (a) Varies directly as velocity (b) Varies inversely as square of velocity (c) Depends upon orientation of pipe (d) Varies inversely as velocity	1	1	1, 2	1
ix.	The Laminar flow is defined for Reynold's Number: (a) Between 500-600 (b) Between 600-2300 (c) Greater than 2300 (d) Less than 2300	1	1	1, 2	1
x.	A triangular channel section is most economical, when the side slope is: - (a) 1:1 (b) 1:2 (c) 1:3 (d) 1:4	1	1	1, 2	1
Q.2 i.	Write down the statement of Pascal's law.	2	1	3, 4	1
ii.	Define the terms: (a) Gauge pressure (b) Vacuum pressure (c) Newton's law of viscosity	3	1	2, 3, 4	1
iii.	A metal plate 80 cm ² in area rests horizontally on a layer of oil 3 mm thick. A force of 0.5 N applied to the plane horizontally keeps it moving with a uniform speed of 5 cm/s. Find the viscosity of oil.	5	3	2, 3	3
OR iv.	Calculate the horizontal force required to move a metal plate of area 2 x 10 ⁻² m ² with a velocity of 4.5 x 10 ⁻² ms ⁻¹ when it rests on a layer of oil 1.5 x 10 ⁻³ m thick. $\eta = 2 \text{ Nsm}^{-2}$.	5	3	2, 3	3

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Q.3 i.	What do you understand by velocity potential and stream function?	2	1	2, 3	1
ii.	Deduce an expression for Navier-Stoke's equation with all the assumptions.	8	4	3, 4, 5	4
OR iii.	Derive the empirical relation for circulation and vorticity of fluid flow.	8	4	3, 4, 5	4
Q.4 i.	What do you understand with the term dimensional analysis?	3	1	2, 3	1
ii.	Explain in brief about the principal of similitude. Also discuss its applications.	7	1	2, 3	1
OR iii.	Discuss in detail the stepwise procedure of Buckingham pi theorem.	7	2	2, 3	2
Q.5 i.	Write in detail about Hardy Cross method.	4	4	3, 4	2
ii.	Derive an expression for Darcys-Wiesbach equation.	6	4	3, 4, 5	4
OR iii.	Compute the head loss due to pipe friction and the power required to maintain flow in a circular pipe of 60 mm diameter and 800 m laid horizontal when water flows at a rate: (a) 3 litres per minute; (b) 40 litres per minute. Take dynamic viscosity of water equal to 1.25 x 10 ⁻³ Nsm ⁻² . Assume that for the pipe absolute roughness, k is 0.00007 m.	6	3	2, 3	3
Q.6	Attempt any two:				
i.	What do you understand by Normal depth? How it effects the flow in open channel?	5	2	2, 3	2
ii.	Derive the relation for most economical rectangular channel section.	5	4	3, 4, 5	3
iii.	What is hydraulic jump? Derive a mathematical expression for hydraulic jump.	5	4	3, 4, 5	3

Marking Scheme
CE3CO19 Fluid Mechanics

				OR	iii.	One mark for correct expression Four marks for each derivation	8
Q.1	i)	c. Real Fluid	1				
	ii)	d. None of the above	1	Q.4	i.	Three marks for correct explanation	3
	iii)	b. Flow Net	1		ii.	Four marks for correct explanation Three marks for correct application	7
	iv)	a. Vorticity	1	OR	iii.	One mark for each step	7
	v)	a. Strain	1				
	vi)	c. Fundamental dimension	1	Q.5	i.	Four marks for correct explanation	4
	vii)	c. 6.17	1		ii.	Two marks for correct statement One mark for assumptions Two marks for correct derivation One mark for correct expression	6
	viii)	a. Varies directly as velocity	1	OR	iii.	One mark for given data Two marks for correct formula Two marks for correct steps One mark for correct answer	6
	ix)	d. Less than 2300	1				
	x)	a. 1:1	1				
Q.2	i.	Two marks for correct statement.	2	Q.6			
	ii.	One mark for each correct definition.	3		i.	Three marks for correct explanation Two marks for correct effects	5
	iii.	One mark for given data. Two marks for correct expression Two marks for correct answer	5		ii.	One mark for correct statement Two marks for correct data considered Two marks for correct expression	5
OR	iv.	One mark for given data. Two marks for correct expression Two marks for correct answer	5		iii.	One mark for correct definition Two marks for correct data considered Two marks for correct expression	5
Q.3	i.	One mark for each correct definition	2			*****	
	ii.	Two marks for correct statement Two marks for assumptions Three marks for correct derivation	8				