

Total No. of Questions: 6

Total No. of Printed Pages: 3

Enrollment No.....



Programme: B. Tech.

Branch/Specialisation: CE

Faculty of Engineering  
End Sem Examination Dec 2024  
CE3CO19 Fluid Mechanics

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

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

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|-----|------------------|--|----------|---|------------|---|
| Q.3 | i.               | What do you understand by velocity potential and stream function?  | <b>2</b> | 1 | 2, 3       | 1 |
|     | ii.              | Deduce an expression for Navier-Stoke's equation with all the assumptions.   | <b>8</b> | 4 | 3, 4,<br>5 | 4 |
| OR  | iii.             | Derive the empirical relation for circulation and vorticity of fluid flow.   | <b>8</b> | 4 | 3, 4,<br>5 | 4 |
| Q.4 | i.               | What do you understand with the term dimensional analysis?   | <b>3</b> | 1 | 2, 3       | 1 |
|     | ii.              | Explain in brief about the principal of similitude. Also discuss its applications.   | <b>7</b> | 1 | 2, 3       | 1 |
| OR  | iii.             | Discuss in detail the stepwise procedure of Buckingham pi theorem.   | <b>7</b> | 2 | 2, 3       | 2 |
| Q.5 | i.               | Write in detail about Hardy Cross method.  | <b>4</b> | 4 | 3, 4       | 2 |
|     | ii.              | Derive an expression for Darcys-Wiesbach equation.   | <b>6</b> | 4 | 3, 4,<br>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 $1.25 \times 10^{-3}$ Nsm $^{-2}$ . Assume that for the pipe absolute roughness, k is 0.00007 m. | <b>6</b> | 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?   | <b>5</b> | 2 | 2, 3       | 2 |
|     | ii.              | Derive the relation for most economical rectangular channel section.   | <b>5</b> | 4 | 3, 4,<br>5 | 3 |
|     | iii.             | What is hydraulic jump? Derive a mathematical expression for hydraulic jump.   | <b>5</b> | 4 | 3, 4,<br>5 | 3 |

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## Marking Scheme

### CE3CO19 Fluid Mechanics

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