



GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K₁ to K₆)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

B.E DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

CIVIL ENGINEERING

U14CET301: Fluid Mechanics

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Express 75m of water in terms of height of mercury CO1 [K₂]
 - a) 6.66m of mercury
 - b) 6.66cm of mercury
 - c) 5.51m of mercury
 - d) 5.51cm of mercury
2. In a venturimeter, the angle of the diverging section is more than that of converging section. CO4 [K₁]
 - a) True
 - b) False
 - c) Insufficient data
 - d) Can't say
3. For a stable equilibrium which of the statements are true CO3 [K₁]

Statement 1: A submerged body is said to be stable if it comes back to its original position after a slight disturbance

Statement 2: The centre of buoyancy is above the centre of gravity

Statement 3: The weight of the body is not equal to the buoyant force.

 - a) Statement 1 is only true
 - b) Statement 2 is only true
 - c) Statement 3 is only true
 - d) Statement 1 & 2 are true
4. For the property of fluid which of the statements are true CO2 [K₁]

Statement 1: All liquids are fluids

Statement 2: All gases are fluids

Statement 3: All vapour are gases

 - a) Statement 1 is only true
 - b) Statement 2 is only true
 - c) Statement 1 & 2 are true
 - d) All the statements are true
5. Consider the following statements: CO5 [K₂]

	A	B	C	D
a)	iii	iv	ii	i
b)	iii	iv	ii	i
c)	iv	iii	i	ii
d)	iv	iii	i	ii

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

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| 11. "The bulk modulus of elasticity of fluid increases with increase in pressure", demonstrate. | CO2 | [K ₂] |
| 12. A rectangular plane surface is 2m wide and 3m deep. Find the total pressure and position of centre of pressure when the upper edge coincides with the water surface. | CO1 | [K ₃] |
| 13. Give examples for Newtonian and non Newtonian fluids and explain about it. | CO2 | [K ₂] |
| 14. Illustrate a stable equilibrium in submerged bodies. | CO3 | [K ₃] |
| 15. Explain the process of a body floating in water. | CO3 | [K ₂] |
| 16. The fluid flow field is given by $V = x^2yi + y^2zj - (2xyz + yz^2)k$. Prove that this is a case of a possible steady incompressible flow field | CO4 | [K ₁] |
| 17. Explain the principle of pitot tube. | CO4 | [K ₂] |
| 18. Explain similitude and state the types of similitude. | CO5 | [K ₂] |
| 19. Find the head lost due to friction in a pipe of diameter 300mm and length 50m, through which water is flowing at a velocity 3m/s using Darcy formula. | CO4 | [K ₃] |
| 20. Differentiate free vortex and forced vortex flow. | CO3 | [K ₂] |

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

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|--|-----|-------------------|
| 21. A u-tube manometer is used to measure the pressure of water in a pipeline which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to the atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the mainline if the difference in level of mercury in the limbs of u-tube is 10cm and the free surface of the mercury is in level with the centre of the pipe. If the pressure of water in pipeline is reduced to 9810N/m ² calculate the new difference in the level of mercury. Sketch the arrangements | CO1 | [K ₃] |
| 22. A vertical sluice gate is used to cover an opening in a dam. The opening is 2m wide and 1.2m high. On the upstream of the gate, the liquid of sp.gr 1.45 lies up to a height of 1.5m above the top of the gate, whereas on the downstream side the water is available up to a height touching the top of the gate. Find the resultant force acting on the gate and position of centre of pressure. Find also the force acting horizontally at the top of the gate which is capable of opening it. Assume that the gate is hinged at the bottom. | CO1 | [K ₃] |

23. A body has the cylindrical upper portion of 3m diameter and 1.8m deep. The lower portion is a curved one, which displaces a volume of 0.6m^3 of water . the centre of buoyancy of the curved portion is at a distance of 1.95m below the top of the cylinder. The centre of gravity of the whole body is 1.2m below the top of the cylinder. the total displacement of water is 3.9 tones. Identify the meta-centric height of the body CO3 [K₃]
24. Develop the Bernoulli's equation for real fluids. CO2 [K₃]
25. The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 N/cm^2 while the vacuum pressure head at the throat is 37cm of mercury. Find the rate of flow. Assume 4% of the differential head is lost between the inlet and throat. Find also the value of C_d for venturimeter. CO4 [K₃]
26. Find an expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity μ . CO5 [K₃]
