Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18ME2039** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLUID MECHANICS AND FLUID MACHINES** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | Define kinematic viscosity. | CO1 | 1 |
| 2. | Distuinguish Newtonian and Non-Newtonian fluid. | CO3 | 1 |
| 3. | State pascal’s law. | CO2 | 1 |
| 4. | When fluid is at rest, the shear stress is equal to \_\_\_\_\_\_\_\_\_. | CO1 | 1 |
| 5. | Differentiate between laminar and trubulent flow. | CO3 | 1 |
| 6. | Define velocity potential function. | CO2 | 1 |
| 7. | Name the assumptions made while deriving Bernoulli’s equation. | CO4 | 1 |
| 8. | Write Newton’s second law of motion. | CO4 | 1 |
| 9. | State Bucking ham’s π theorem. | CO5 | 1 |
| 10. | Give the definition of Reynold’s number. | CO5 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | The surface tension of water in contact with air at 200C is 0.0725 N/m. The pressure inside a droplet of water is to be 0.02 N/cm2 greater than the outside pressure. Calculate the diameter of the droplet of water. | CO1 | 3 |
| 12. | The pressure intensity at a point in oil is given 3.924 N/cm2. Find the height when the specific gravity of the oil is 0.9. | CO1 | 3 |
| 13. | A stream function is given by Ψ = 5x – 6y. Calculate the velocity components and magnitude of the resulatant velocity at any point. | CO2 | 3 |
| 14. | Water is flowing through a pipe of 5 cm diameter under a pressure of 29.43 N/cm2 (guage) and with mean velocity of 2 m/s. Find the total head or total energy per unit weight of the water at a cross section, which is 5 m above the datum line. | CO4 | 3 |
| 15. | Mention the types of similarities. | CO5 | 3 |
| 16. | Explain boundary layer thickness and give the momentum thickness equation for laminar flow over a flate plate. | CO6 | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | |
| 17. |  | Calculate the capillary rise in a glass tube of 2.5 mm of diameter when immersed vertically in (a) water and (b) mercury. Take surface tenions σ = 0.0725 N/m for water and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact is1300. | CO1 | 12 |
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| 18. |  | A U-tube manometer is used to measure the pressure of water in a pipe line which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs of U-tube is 10 cm and the free surface of mercury is in level with centre of pipe. If the pressure of water in pipe line is reduced to 9810 N/m2, calculate the new difference in the level of mercury. Sketch the arrangements in both cases. | CO1 | 12 |
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| 19. |  | Derive the three-dimensional continuity equation in x and y coordinates. | CO4 | 12 |
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| 20. | a. | An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the co-efficient of discharge of the orifice meter is 0.64. | CO1 | 6 |
| b. | An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter of 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through horizontal venturimeter. Take co-efficient of discharge as 0.98. | CO1 | 6 |
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| 21. |  | The resisting force R of a supersonic plane during flight can be considered as dependent upon length of the aircraft (Ɩ), velocity (v). air viscosity (μ), air density (ρ) and the bulk modulus of air (K). Express the functional relationship between these variables and resisting force using Rayleigh’s method. | CO5 | 12 |
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| 22. |  | A 450 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600 mm and 300 mm respectively. Find the force excerted by water on the bend if the intensity of pressure at inlet to bend is 8.829 N/cm2 and rate of flow of water is 600 liters/s. | CO4 | 12 |
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| 23. |  | A 30 cm diameter pipe, conveying water, branches in two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. | CO4 | 12 |
|  |  | **Compulsory:** |  | |
| 24. |  | Explain the concept of boundary layer over flat plates with a neat velocity profile sketch. | CO6 | 12 |