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

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

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| **Code :** | **18AE2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BASIC OF FLUID MECHANICS** | **Max. Marks :** | **100** |
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| **Q. No.** | | | **Questions** | | **Course**  **Outcome** | | | | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | | | | | | | |
| 1. | | | Define Metacenter. | | CO1 | | | | 1 |
| 2. | | | What is center of pressure? | | CO1 | | | | 1 |
| 3. | | | Give the velocity potential expression for a doublet flow. | | CO2 | | | | 1 |
| 4. | | | The potential flow pattern that results when you add Uniform, source and sink flow is\_\_\_\_\_\_\_\_\_\_. | | CO2 | | | | 1 |
| 5. | | | The Bernoulli’s equation for an incompressible is \_\_\_\_\_\_\_\_\_\_\_\_\_\_. | | CO3 | | | | 1 |
| 6. | | | The pitot tube is used to measure \_\_\_\_\_\_\_\_\_\_\_ pressure. | | CO3 | | | | 1 |
| 7. | | | State any 2 energy losses in pipes. | | CO4 | | | | 1 |
| 8. | | | What is the cause of pressure drop in a pipe flow? | | CO4 | | | | 1 |
| 9. | | | Define Mach number. | | CO5 | | | | 1 |
| 10. | | | What is Dynamic similarity? | | CO5 | | | | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | | |
| 11. | | State the difference between gauge pressure, vacuum pressure and absolute pressure. | | | | CO1 | | 3 | |
| 12. | | Derive the Stream function and velocity potential for a Source flow. | | | | CO2 | | 3 | |
| 13. | | What is the velocity measured by the Pitot tube when it is kept in an airflow of density ρ = 1.2256 kg/m3 and a total pressure of 2.5× 104 N/m2 with a static pressure of 101325 N/m2? | | | | CO3 | | 3 | |
| 14. | | Explain D’Alembert’s Paradox with an example. | | | | CO4 | | 3 | |
| 15. | | What is dimensional analysis? Explain the three similarities in it. | | | | CO5 | | 3 | |
| 16. | | Give the expression for the force exerted on a stationary and an inclined plate and compare the results. | | | | CO6 | | 3 | |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | | | | | | |
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| 17. | a. | | | The right limb of a simple U-tube manometer containing mercury is open to the  atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity of 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe, if the difference of mercury level in the two limbs is 20 cm. | | | CO1 | | 8 |
|  | b. | | | Classify the fluid flows based on the effect of viscosity and shear stress and explain the effect of temperature on viscosity of the fluid. | | | CO1 | | 4 |
|  |  | | |  | | |  | |  |
| 18. | a. | | | Derive the stream function and velocity potential for a Rankine half body along with the location of the stagnation point on it. | | | CO2 | | 8 |
| b. | | | Define Stream line, Streak line and Path line. | | | CO2 | | 4 |
|  |  | | |  | | |  | |  |
| 19. |  | | | A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take Cd = 0.98. Specific gravity of mercury = 13.6. | | | CO4 | | 12 |
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| 20. | a. | | | Calculate the discharge through a pipe of diameter 200 mm, when the difference of pressure head between the two ends of a pipe 500 m apart is 4 m of water. Take the value of Co-efficient of friction f = 0.009. | | | CO5 | | 6 |
| b. | | | Explain the various major and ninor energy losses in a pipe flow in detail. | | | CO5 | | 6 |
|  |  | | |  | | |  | |  |
| 21. |  | | | Explain the various steps involved in Buckingham’s π theorem with an example. | | | CO6 | | 12 |
|  |  | | |  | | |  | |  |
| 22. |  | | | Derive Euler’s equation of motion with all the necessary assumptions involved. | | | CO3 | | 12 |
|  |  | | |  | | |  | |  |
| 23. |  | | | If for a two-dimensional potential flow, the velocity potential is given by:  φ = 4x(3y- 4), determine the velocity at the point (2, 3). Determine also the value of stream function 'ψ' at the point (2, 3). | | | CO2 | | 12 |
|  | |  | | **Compulsory:** | | | | |  |
| 24. | a. | | | A jet of water of diameter 50 mm strikes a fixed plate in such a way that the angle between the plate and the jet is 30°. The force exerted in the direction of the jet is 1471.5 N. Determine the rate of flow of water. | | | CO6 | | 6 |
| b. | | | A nozzle of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s. Find :  (i) the force on the plate, (ii) the work done, and (iii) the efficiency of jet. | | | CO6 | | 6 |