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



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

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| **Code :** | **18CE2015** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLUID MECHANICS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | Differentiate between absolute pressure and gauge pressure. | CO1 | 1 |
| 2. | Infer metacentric height and stability of floating bodies. | CO1 | 1 |
| 3. | For a three dimensional flow, write the incompressible continuity equation. | CO3 | 1 |
| 4. | Deduce streak line. | CO3 | 1 |
| 5. | Name the type of notch / weir which is best suited for measuring small (low) discharges. | CO2 | 1 |
| 6. | Relate head loss due to contraction and entrance in a pipe. | CO4 | 1 |
| 7. | Paraphrase laminar flow. | CO3 | 1 |
| 8. | Mention the value of Reynold`s number up to which laminar boundary layer occurs. | CO5 | 1 |
| 9. | Clarify dimensional homogeneity. | CO6 | 1 |
| 10. | List the dominant force in an open channel flow. | CO6 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Find the kinematic viscosity of a liquid whose specific gravity is 0.95 and dynamic viscosity 1.2 x 10-3 N-s/m2. | CO1 | 3 |
| 12. | The diameters of a pipe at two sections 1-1 and 2-2 are 200mm and 300mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/s. Find : i) Discharge through the pipe and ii) Velocity of water at section 2-2 | CO3 | 3 |
| 13. | State the advantages of a triangular notch over a rectangular notch. | CO2 | 3 |
| 14. | Mention the importance of Moody’s diagram. | CO4 | 3 |
| 15. | List any three methods of preventing the separation of boundary layer. | CO5 | 3 |
| 16. | Identify the similarities that must be ensured between the model and the prototype. | 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. | a. | An oil of viscosity 5 Poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5 m and it rotates at 200 rpm. Calculate the power lost in oil for a sleeve length of 100 mm. The thickness of oil film is 1mm. | CO1 | 6 |
| b. | A hydraulic press has a ram of 20 cm diameter and a plunger of 3 cm diameter. It is used for lifting a weight of 30 kN. Find the force required at the plunger. | CO1 | 6 |
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| 18. | a. | Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Also find the position of centre of pressure. | CO1 | 6 |
| b. | An U-tube Manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe and the right limb is open to atmosphere. The centre of pipe is 100 mm below the level of mercury in the open limb. If the difference in mercury level in two limbs is 160 mm, find the absolute pressure of oil in the pipe. | CO1 | 6 |
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| 19. | a. | Find the discharge over a rectangular weir of length 80m. The head of water over the weir is 1.2m. The velocity of approach is 1.5m/s. Assume Cd = 0.6 | CO2 | 4 |
| b. | A horizontal venturimeter with inlet diameter 200mm and throat diameter 100mm. is used to measure the flow of water. The pressure at inlet is 0.18 N/mm2 and the vaccum pressure at the throat is 280mm of mercury.  Find the rate of flow. Cd = 0.98. | CO2 | 8 |
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| 20. |  | A piping system consists of three pipes arranged in series. The lengths are 1200m, 750, 600m and diameters are 750mm, 600mm, and 450mm respectively.  i) Transform the system to an equivalent of 450mm diameter pipe.  ii) Determine an equivalent diameter pipe for a 2550m long pipe. | CO4 | 12 |
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| 21. | a. | A 2mm diameter metallic ball of specific gravity 11 is allowed to fall in a fluid of specific gravity 0.9 and viscosity 1.4 Ns/m2. Determine: Drag force exerted by the fluid on the ball. | CO5 | 6 |
| b. | A 1.8m wide 5m long plate moves through stationary air of density 1.22 kg/m3 and viscosity 1.8 x 10-5 Ns/m2 at a velocity of 1.75 m/s parallel to its length. Determine the drag force on one side of the plate.  i) Assuming laminar flow condition ii) Assuming turbulent flow condition | CO5 | 6 |
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| 22. | a. | Discuss the criteria for selection of repeating variables in Buckingham method. | CO6 | 4 |
| b. | The resisting force F of a plane during flight can be considered as dependent on length of aircraft *l*, velocity v, viscosity μ, density ρ, bulk modulus of air K. Express the functional relationship between these variables and the resisting force using Buckingham π theorem method. | CO6 | 8 |
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| 23. | a. | Differentiate between pipes in series and pipes in parallel. | CO4 | 4 |
| b. | A horizontal pipe 0.1m in diameter is joined by a sudden enlargement to a 0.15m diameter pipe. Water is flowing through it at the rate of 2m3/min. Find the loss of head due to abrupt expansion and the pressure difference in the two pipes. If the change of section is gradual with out loss, what would be the change pressure. | CO4 | 8 |
|  |  | **Compulsory:** | | |
| 24. |  | The pressure drop in a pipe of diameter D and length  depends on the  density  and viscosity  of the fluid flowing, mean velocity V of flow and  the average height of protuberance t, show that pressure  drop . | CO6 | 12 |