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



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

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| **Code :** | **18FP2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLUID MECHANICS FOR FOOD ENGINEERS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | Define weight density. | CO1 | 1 |
| 2. | State Newton’s law of viscosity. | CO1 | 1 |
| 3. | Draw the figure of piezometer and write the procedure for pressure measurement. | CO2 | 1 |
| 4. | List the different types of pressure. | CO2 | 1 |
| 5. | Define centre of pressure. | CO3 | 1 |
| 6. | Recall the methods of describing fluid flow. | CO3 | 1 |
| 7. | A circular plate of diameter 4 m is immersed vertically in water and the top coincides with the free surface of water. Find the total pressure. | CO4 | 1 |
| 8. | Define stream function. | CO4 | 1 |
| 9. | State the assumptions of Bernoulli’s equation. | CO5 | 1 |
| 10. | Draw the figure of orifice meter and mention the parts. | CO5 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Discuss the different types of fluids. | CO1 | 3 |
| 12. | The pressure intensity at a point in a fluid is given as 3.924x104 N/m2.  Find the corresponding height of fluid when the fluid is:  (a) water (b) oil of density 900 kg/m3. | CO2 | 3 |
| 13. | Enumerate the formula for the determination of horizontal and vertical components of the resultant force on a submerged curved suface. | CO3 | 3 |
| 14. | The diameters of a pipe at sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Also determine the velocity at section 2. | CO4 | 3 |
| 15. | Name the different forces present in a fluid flow. | CO5 | 3 |
| 16. | Find the loss of head when a pipe of diameter 0.2 m is suddenly enlarged to a diameter of 0.4 m. The rate of flow of water through the pipe is 0.25 m3/s. | 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. | Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N. | | CO1 | 6 |
| b. | A plate 0.025 mm distant from a fixed plate, moves at 60 cm/s and requires a force of 2 N/m2 to maintain this speed. Determine the fluid viscosity between the plates. | | CO1 | 6 |
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| 18. |  | Derive the formula to find the differential pressure between two pipes when they are located at : (i) different levels (ii) same level. | | CO2 | 12 |
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| 19. |  | A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and (i) coincides with water surface and (ii) 2.5 m below the free water surface. | | CO3 | 12 |
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| 20. |  | A fluid flow field is given by : *V= x2y* ***i*** *+ y2z* ***j*** *– (2xyz + yz2)****k.***  Calculate the velocity and acceleration at the point (2,1,3). | | CO4 | 12 |
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| 21. |  | An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm2 and 9.81 N/cm2 respectively. Coefficient of discharge for orifice meter is given as 0.6. Find the discharge of water through the pipe. | | CO5 | 12 |
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| 22. |  | A differential manometer is connected at the two points A and B of two pipes as shown in figure. The pipe A contains a liquid of specific gravity 1.5 while pipe B contains a liquid of specific gravity 0.9. The pressures at A and B are 1 kgf/cm2 and 1.8 kgf/cm2 respectively. Find the difference in mercury level(h) in the differential manometer. | | CO2 | 12 |
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| 23. | a. | Calculate the capillary effect in millimetres in a glass tube of 4 mm diameter when immersed vertically in (i) water and (ii) mercury. Take surface tension for water and mercury as 0.073 N/m and 0.51 N/m respectively. The specific gravity for mercury is given as 13.6 and angle of contact is 130o. | | CO1 | 5 |
| b. | Derive the formula to find the velocity of flow using a Pitot tube. | | CO5 | 7 |
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|  | **Compulsory:** | | | | |
| 24. |  | A main pipe divides into two parallel pipes which again forms one pipe as shown in figure. The length and diameter for the first parallel pipe are 2000 m and 1 m respectively, while the length and diameter of second parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main pipe is 3 m3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005. | CO6 | | 12 |