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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **17FP2004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLUID MECHANICS FOR FOOD ENGINEERS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N. | CO1 | 10 |
| b. | 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 the oil film is 1 mm. | CO2 | 10 |
| (OR) | | | | |
| 2. | a. | Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8m x 0.8m and an inclined plane with angle of inclination 30o. The weight of the square plate is 300N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5mm. | CO2 | 10 |
| b. | The surface tension of water in contact with air at 20o C 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. | CO2 | 5 |
| c. | A gas weighs 16 N/m3 at 25℃ and at an absolute pressure of 0.25 N/mm2. Determine the density of the gas and the gas constant. | CO1 | 5 |
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| 3. | a. | A differential manometer is connected at the two points A and B as shown in the fig. At B air pressure is 9.81 N/cm2, find the absolute pressure at A.  C:\Users\HP\Desktop\New Doc 2017-07-30 (1).jpg | CO3 | 10 |
| b. | Derive the formula to find the differential pressure between two points of tanks at different levels and containing liquids of different densities. | CO3 | 10 |
| (OR) | | | | |
| 4. | a. | A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below. | CO3 | 10 |
| b. | An inverted differential manometer is connected to two pipes A and B containing water as shown in figure. The fluid in manometer is oil of specific gravity 0.8. For the manometer readings shown in the figure, find the difference of **pressure head(h)** between A and B. | CO3 | 10 |
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| 5. | a. | 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 the upper edge is horizontal and a) coincides with water surface and b) 2.5 m below the free water surface. | CO4 | 10 |
| b. | A circular plate 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and the position of center of pressure. | CO4 | 10 |
| (OR) | | | | |
| 6. | a. | Determine the total pressure and centre of pressure of an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. | CO4 | 10 |
| b. | Find the total pressure and position of center of pressure on a triangular plate of base 2 m and height 3 m which is immersed in water in such a way that the plane of the plate makes an angle 60o with the free surface of the water. The base of the plate is parallel to water surface and at a depth 2.5 m from water surface. | CO4 | 10 |
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| 7. | a. | A 30 cm diameter pipe, conveying water, branches into 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. | CO5 | 10 |
| b. | Water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If pressure at section 1 is 39.24 N/cm2, find the intensity of pressure at section 2. | CO5 | 10 |
| (OR) | | | | |
| 8. | a. | The velocity vector in a fluid flow is given by ***V = 4x3i - 10x2yj + 2tk.*** Calculate the velocity and acceleration at the point (2,1,3) at time t = 1. | CO5 | 10 |
| b. | Derive the formula to find the coefficient of discharge of venturimeter. | CO5 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy’s formula and (ii) Chezy’s formula for which C=60. | CO6 | 10 |
| b. | Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end is connected to a reservoir and other end open to atmosphere. The pipe is horizontal and the water level in tank is 4 m above the center of pipe. Consider all minor losses and assume Darcy’s friction factor *f* = 0.009. | CO6 | 10 |