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



**End Semester Examination – Nov/Dec – 2017**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| **Code :** | **14CE2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MECHANICS OF FLUIDS** | **Max. marks :** | **100** |

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | | **Marks** |
| 1. | 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 300. 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. | | CO1 | 5 |
| b. | Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N. | | CO1 | 5 |
| c. | 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 1mm. | | CO3 | 10 |
| (OR) | | | | | |
| 2. | 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. | | CO2 | 8 |
| b. | A differential manometer is connected at the two points A and B of the two pipes as shown in the fig. 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 1.80 kgf/cm2 respectively. Find the difference in mercury level in the differential manometer. | | CO2 | 12 |
| 3. | a. | 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. | | CO3 | 10 |
|  | b. | 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. | | C02 | 10 |
| (OR) | | | | | |
| 4. | a. | Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm2 and the pressure at the upper end is 9.81 N/cm2. Determine the difference in datum head if the rate of flow through pipe is 40 litres/sec. | | CO2 | 10 |
|  | b. | A fluid flow field is given by *V = 4x3i - 10x2yj + 2tk****.*** Calculate the velocity and acceleration at the point (2,1,3) at time t = 1. | | CO2 | 10 |
| 5. | a. | A main pipe divides into two parallel pipes which again forms one pipe as shown in the figure. The length and diameter for the first parallel pipe are 2000 m and 1 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3 m3/s. The co-efficient of friction for each parallel pipe is same and equal to 0.005.  F:\mechanics of fluids\QP 2017-18\New Doc 2017-09-27_1.jpg | | CO3 | 10 |
|  | b. | 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 formula ii. Chezy’s formula for which C = 60. Take *v* (kinematic viscosity) for water = 0.01 stoke. | | CO3 | 10 |
| (OR) | | | | | |
| 6. |  | The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering : i.Minor loses also ii. Neglecting minor losses. | | CO3 | 20 |
| 7. |  | In a vertical pipe conveying oil of specific gravity 0.8 two pressure gauges have been installed at A and B where the diameters are 16 cm and 8 cm respectively. A is 2 m above B. The pressure gauge readings have shown that the pressure at B is greater than at A by 0.981 N/cm2. Neglecting all losses, calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U- tube containing mercury, calculate the difference of level of mercury in the two limbs of the U-tube. | | CO2 | 20 |
| (OR) | | | | | |
| 8. | a. | 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. Co-efficient of discharge for the orifice meter is given as 0.6. Find the discharge of water through pipe. | | CO2 | 15 |
|  | b. | A pitot-static tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6 m and the static pressure head is 5 m. Calculate the velocity of flow assuming co-efficient of tube equal to 0.98. | | CO2 | 5 |
|  | | **Compulsory**: | |  |  |
| 9. |  | A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all the losses of head which occur, determine the rate of flow. Take *f* = .01 for both sections of pipe. | | CO3 | 20 |

ALL THE BEST