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

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

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| **Code :** | **14CE2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MECHANICS OF FLUIDS** | **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. | 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. | CO1 | 10 |
| b. | Calculate the dynamic viscosity of oil, which is used for lubrication between square plate of size 0.8m x 0.8 m and an inclined plane with angle of inclination 30o. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm. | CO1 | 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. | CO1 | 10 |
| b. | 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 in the differential manometer. | CO1 | 10 |
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| 3. | a. | Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m 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. | CO1 | 10 |
| b. | The pressure outside the droplet of water of diameter 0.04 mm is 10.32 N/cm2 (atmospheric pressure). Calculate the pressure within the droplet if surface tension is given as 0.0725 N/m of water. | CO1 | 10 |
| (OR) | | | | |
| 4. | a. | 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 |
| b. | The water is flowing through a pipe of length 100m having diameter 600mm at the upper end and 300mm at the lower end, at the rate of 50lit/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62 N/cm2. | CO2 | 10 |
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| 5. | a. | A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm2 and the vacuum pressure at the throat is 30cm of mercury. Find the discharge of water through venturimeter. Take Cd = 0.98. | CO2 | 10 |
| b. | A 30cm X 15cm venturimeter is inserted in a vertical pipe carrying water, flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20cm. Find the discharge. Take Cd=0.98. | CO2 | 10 |
| (OR) | | | | |
| 6. | a. | An orificemeter with orifice diameter 10cm is inserted in a pipe of 20cm 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 orificemeter is given as 0.6. Find the discharge of water through pipe. | CO2 | 10 |
| b. | A submarine moves horizontally in sea and has its axis 15m below the surface of water. A pitot-tube properly placed just in front of the submarine and along its axis is connected to the two limbs of a U-tube containing mercury. The difference of mercury level is found to be 170mm. Find the speed of the submarine knowing that the specific gravity is 13.6 and that of sea water is 1.026 with respect of fresh water. | CO2 | 10 |
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| 7. | a. | Determine the height of a rectangular weir of length 6m to be built across a rectangular channel. The maximum depth of water on the upstream side of the weir is 1.8m and the discharge is 2000lit/sec. Take Cd=0.6 and neglect end contractions. | CO3 | 10 |
| b. | The head of water over a rectangular notch is 900mm. The discharge is 300lit/sec. Find the length of the notch, when Cd=0.62. | CO3 | 10 |
| (OR) | | | | |
| 8. |  | Determine the difference in the elevations between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 300mm and length 400m. The rate of flow of water through the pipe is 300lit/sec. Consider all losses and take the value of f=0.008. | CO3 | 20 |
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|  | | **Compulsory**: |  |  |
| 9. |  | Determine the rate of flow of water through a pipe of diameter 20cm and length 50m when one end of the pipe is connected to a tank and the other end is open to the atmosphere. The pipe is horizontal and the height of water in the tank is 4m above the centre of the pipe. Consider all minor losses and take f= 0.009 in the formula | CO3 | 20 |