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



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

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| **Code :** | **17AE2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FUNDAMENTALS OF FLUID FLOW** | **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. | If the velocity profile of a fluid over a plate is parabolic with the vertex 20cm from the plate, where the velocity is 120 cm/sec. Calculate the velocity gradients and shear stresses at a distance of 0,10 and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise. | CO1 | 20 |
| **(OR)** | | | | |
| 2. | a. | A differential manometer is connected at the two points A and B of two pipes as shown in fig. below. 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. | CO1 | 10 |
| b. | Explain in detail the different types of manometer. | CO1 | 10 |
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| 3. | a. | Sketch the stream lines represented by ψ=x2+y2. Also find out the velocity and its direction at point (1,2). | CO3 | 15 |
| b. | Explain uniform, free and forced vortex flow with neat sketches. | CO3 | 5 |
| **(OR)** | | | | |
| 4. |  | A flow of constant density ρ = 1000 kg/m3 enters a nozzle of inlet area A=100cm2 with a speed of V=100m/s and discharges at the atmospheric pressure p = 1 bar through the exit where the area is A=50cm2. To maintain a steady flow through the converging nozzle, determine the   1. Required pressure p at the entrance. 2. Force needed to hold the nozzle. | CO4  CO4 | 10  10 |
|  |  |  |  |  |
| 5. | a. | Obtain Bernoulli’s equation from Euler’s equation with suitable assumptions. | CO4 | 15 |
| b. | A pipe, through which water is flowing, is having diameters, 20cm and 10cm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given by 4m/s. Find the velocity head at sections 1 and 2. | CO4 | 5 |
| **(OR)** | | | | |
| 6. |  | 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. | CO5 | 20 |
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| 7. |  | An oil of viscosity 0.1 Ns/m2 and relative density 0.9 is flowing through a circular pipe of diameter 50mm and of length 300m. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 m and also the shear stress at the pipe wall. | CO5 | 20 |
| **(OR)** | | | | |
| 8. |  | A horizontal pipe of diameter 500 mm is suddenly contracted to a diameter of 250 mm. The pressure intensities in the large and smaller pipe is given as 13.734 N/cm2 and11.772 N/cm2 respectively. Find the loss of head due to contraction if Cc=0.62. Also determine the rate of flow of water. | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Derive an expression for the lift force in terms of non-dimensional parameters using Buckingham Pi theorem. | CO6 | 20 |