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



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

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| **Code :** | **17CE2004** | **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 oil film is 1mm. | CO1 | 10 |
| b. | A hydraulic press has a ram of 20 cm diameter and a plunger of 3 cm diameter. It is used for lifting a weight of 30 kN. Find the force required at the plunger. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Find the magnitude and direction of the resultant force due to water acting on a roller gate of cylindrical form of 4 m diameter when the gate is placed on the dam in such a way that water is just going to spill. Take the length of gate as 8 m. | CO1 | 10 |
| b. | A rectangular plate 3 metres long and 1 metre wide is immersed vertically in water in such a way that its 3 metres side is parallel to the water surface and 1 metre is below it. Find total pressure and position of centre of pressure. | CO1 | 10 |
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| 3. |  | State Bernoulli’s equation for flow of an incompressible fluid. Derive an expression for Bernoulli’s theorem from first principles and state the assumptions made for such a derivation. | CO2 | 20 |
| **(OR)** | | | | |
| 4. | a. | The stream function is given by ψ =5x-6y, Calculate the velocity components and also magnitude and direction of the resultant velocity at any time. | CO2 | 10 |
| b. | Obtain the equation to the stream lines for the velocity field given as  V = 2x3 i – 6x2 y j | CO2 | 10 |
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| 5. | a. | Infer Moody’s Diagram. | CO4 | 6 |
| b. | The rate of flow of water through the horizontal pipe is 0.25m3/s. The diameter of the pipe changes from 200mm to 400 mm. The pressure intensity in the smaller pipe is 11.772N/cm2. Find i) Loss of head due to sudden enlargement, ii) pressure intensity in large pipes. | CO5 | 14 |
| **(OR)** | | | | |
| 6. | a. | Compare Pipes in series with Pipes in parallel. | CO5 | 6 |
| b. | An oil of specific gravity 0.9 and viscosity 0.06 Poise is flowing through a pipe of diameter 200 mm at the rate of 60 liters per second. Find the head lost due to friction for a 500 m length of pipe. Also find the power required to maintain this flow. | CO4 | 14 |
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| 7. | a. | Derive Darcy’s Weisbach Equation. | CO4 | 10 |
| b. | A horizontal venturimeter with inlet and throat diameter 300 mm and 100mm respectively is used to measure the rate of flow. The pressure intensity at the inlet is 130 kN/m2 and the vacuum pressure at the throat is 350mm of mercury. Assuming 3% head lost between inlet and throat, find the coefficient of discharge. | CO3 | 10 |
| **(OR)** | | | | |
| 8. |  | Determine the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by u/U =2(y/δ) - (y/δ)2 where ‘u’ is the velocity at a distance y from the plate and u = U at y = δ where δ is boundary layer thickness. | CO6 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | Determine the rate of flow of water through the pipe of diameter 20 cm and length 50m with one end of the pipe is connected to a tank and the other end is open to atmosphere. The pipe is horizontal and the height of water in the tank is 4m above the centre of the pipe. Consider all the minor losses and take f = 0.009. | CO5 | 20 |