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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **Ph.D. Course Work End Term Examinations – JAN-FEB 2025** |
| **Date:** 30 – 01-2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** Ph.D. | |
| **Course Code:** MAT833 | **Course Name:** Fluid Mechanics | |
| **Semester**: | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **10** | **10** | **10** | **40** | **30** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 10 marks. 6Q x 10M=60Marks** | | | | |
| **1** | Obtain an expression for the pressure intensity at a point in a fluid at rest. | **10 Marks** | **L2** | **CO1** |
| **2** | Obtain an expression for continuity equation for a three-dimensional flow. | **10 Marks** | **L2** | **CO2** |
| **3** | What are the methods of dimensional analysis. Describe Rayleigh’s method for dimensional analysis. | **10 Marks** | **L2** | **CO3** |
| **4** | Derive a Navier-stokes equation for steady, incompressible flow between two concentric rotating cylinders. Including all assumptions and boundary conditions. | **10 Marks** | **L2** | **CO4** |
| **5** | Derive a Navier-stokes equation for an incompressible flow in Cartesian and cylindrical co-ordinates. | **10 Marks** | **L2** | **CO4** |
| **6** | Write in detail about separation of boundary layer and explain the effect of pressure gradient and velocity gradient on boundary layer separation. | **10 Marks** | **L2** | **CO5** |

**Part B**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 20 marks 2Q x 20 = 40 Marks** | | | | | |
| **7.** | **a.**  **b.** | Derive a continuity equation for incompressible fluids.  Derive an expression for velocity distribution of plane-Poiseuille flow, Couette flow and Hagen Poiseuille flow with maximum and minimum velocity. | **5 Marks**  **15 Marks** | **L1**  **L3** | **CO4** |
|  | | | | | |
| **8.** | **a.**  **b.** | Define laminar boundary layer, turbulent boundary layer, laminar sub layer and boundary layer thickness.  Prove that the momentum thickness for boundary layer flows are given by and . | **5 Marks**  **15 Marks** | **L1**  **L3** | **CO5** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***