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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **Ph.D. Course Work End Term Examinations – JAN-FEB 2025** |
| **Date:** 03 – 02- 2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** Ph.D. | |
| **Course Code:** MAT835 | **Course Name:** Heat Transfer and Mass Transfer of Nano fluid | |
| **Semester**: | **Max Marks**: 100 | **Weightage**: 50% |

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

**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** | Explain the Fourier law of heat conduction and newton’s law of cooling with applications. | **10 Marks** | **L2** | **CO1** |
| **2** | Derive an expression for the natural convection heat transfer coefficient based on the integral method. | **10 Marks** | **L2** | **CO2** |
| **3** | State and prove Kirchhoff’s law of radiation. | **10 Marks** | **L2** | **CO3** |
| **4** | Describe any one application of Nanofluids. | **10 Marks** | **L2** | **CO4** |
| **5** | Explain the dimensionless parameters in convective mass transfer. | **10 Marks** | **L2** | **CO5** |
| **6** | Explain the different modes of mass transfer. | **10 Marks** | **L2** | **CO5** |

**Part B**

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| **Answer ALL the Questions. Each question carries 20 marks 2Q x 20 = 40 Marks** | | | | | |
| **7.** | **a.**  **b.** | State the Advantages of utilizing Nano-sized particles in base fluids for heat transfer.  Explain briefly the thermos-physical properties of Nanofluids by providing necessary empirical models for each property. | **5 Marks**  **15 Marks** | **L1**  **L3** | **CO4** |
|  | | | | | |
| **8.** | **a.**  **b.** | Discuss the analogy of heat and mass transfer.  Explain the Fick’s law of diffusion. Enumerate aspects of Fick’s law. | **5 Marks**  **15 Marks** | **L1**  **L3** | **CO5** |

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