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 **PRESIDENCY UNIVERSITY**

  **Bengaluru**

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| **Ph.D. Course Work End Term Examinations – JAN-FEB 2025** |
| **Date:** 31- 01- 2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** Ph.D. |
| **Course Code :** MAT812 | **Course Name** : VALUE DISTRIBUTION THEORY AND DELAY DIFFERENTIAL EQUATION |
| **Semester**:  | **Max Marks**:100 | **Weightage**:50%  |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **20** | **30** | **20** | **20** | **10** |

**Instructions:**

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

**Part A**

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| **Answer ALL the Questions. Each question carries 10 marks. 6Q x 10M=60Marks** |
| **1** | State and prove Borel theorem and Hadmard theorem. | **10 Marks** | **L1** | **CO1** |
| **2** | Define meromorphic function with examples and state and prove Nevanlinna first fundamental theorem. | **10 Marks** | **L2** | **CO2** |
| **3** | Define entire function with examples and find the order & type of $f(z) = e^{z}$. | **10 Marks** | **L2** | **CO1** |
| **4** | Let $f\_{1}, f\_{2},......f\_{m}$ be meromorphic functions in the complex plane then prove that1. $T(r, f\_{1}+f\_{2}+….+ f\_{m}) \leq T (r,f\_{1}) + …. + T(r,f\_{m}) + log m$.
2. $ T(r,$ $f\_{1}.f\_{2}.…. f\_{m}) \leq T (r,f\_{1}) + …. + T(r,f\_{m}) $.
 | **10 Marks** | **L2** | **CO3** |
| **5** | Explain Painleve equations and Differential difference equations. | **10 Marks** | **L3** | **CO3** |
| **6** | Define small function $a(z)$ and State and prove $2^{nd}$ fundamental theorem of Nevanlinna involving three counting functions. | **10 Marks** | **L3** | **CO5** |

**Part B**

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| **Answer the Questions. Each question carries 20 marks 2Q x 20 = 40 Marks** |
| **7.** |  | Explain linear stability of Delay differential equation. | **20 Marks** | **L3** | **CO4** |
|  |
| **8.** |  | Suppose that $f\left(z\right)$ is a non constant meromorphic function in the complex plane and $k$ is a $+$ve integer then prove that $\left(i\right)N\left(r,\frac{1}{f^{\left(r\right)}}\right)\leq T\left(r,f^{\left(r\right)}\right)– T\left(r,f\right)+ N\left(r,\frac{1}{f}\right)+ S\left(r,f\right).$ $(ii)N(r,\frac{1}{f^{(k)}}) \leq N(r,\frac{1}{f}) +K\overbar{N} (r,f) +S(r,f)$. | **20 Marks** | **L3** | **CO2** |

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