|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Roll No. |  |  |  |  |  |  |  |  |  |  |  |  |



 **PRESIDENCY UNIVERSITY**

  **Bengaluru**

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

|  |  |
| --- | --- |
| **School:** SOE | **Program:** Ph.D. |
| **Course Code :**MAT847 | **Course Name :** Numerical Linear Algebra |
| **Semester**: | **Max Marks**:100 | **Weightage**: 50% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO – Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **50** | **-** | **50** | **-** | **-** |

**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** | Define linearly independent and linearly dependent. Check whether or not the following vectors are linearly independent of 𝑅3:1. (1, −2,1), (2,1, −1), (7, −4,1)
2. (2,3,5), (4,9,25)
 | **10 Marks** | **L** | **CO1** |
| **2** | Prove that every finite dimensional inner product space has an orthonormal basis. | **10 Marks** | **L** | **CO1** |
| **3** | Define the Jordan matrix, Defective matrix, Non defective matrix and Positive definite matrix. | **10 Marks** | **L** | **CO1** |
| **4** | 1. Define Vector norm and give one example?
2. Define Matrix norm and give one example?
3. Define convergence of a vector norm ?
4. Define convergent matrices?
 | **10 Marks** | **L** | **CO3** |
| **5** | 1. Define singular value of an $m×n$ matrix?
2. Find the singular values of

 A = $\left[\begin{matrix}2&1\\5&4\\-1&6\\7&8\end{matrix}\right]$ | **10 Marks** | **L** | **CO3** |
| **6** | 1. Define SVD?
2. Write the State of minimax theorem and perturbation theorem for singular values?
 | **10 Marks** | **L** | **CO3** |

**Part B**

|  |
| --- |
| **Answer the Questions. Each question carries 20 marks 2Q x 20 = 40 Marks** |
| **7.** |  | State and prove Cauchy schwarz inequality | **20 Marks** | **L** | **CO1** |
|  |
| **8.** |  | 1. Define subordinate matrix norm.
2. Calculate 1-norm and infinity-norm of

 B = $\left[\begin{matrix}5&-4&2\\-1&2&3\\-2&1&0\end{matrix}\right]$ 1. Calculate Euclidean norm of $\left[\begin{matrix}1&7&3\\4&-2&-2\\-2&-1&1\end{matrix}\right]$
 | **20 Marks** | **L** | **CO3** |

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