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**PRESIDENCY
UNIVERSITY
BENGALURU**

School of Information Science

Mid - Term Examinations November - 2024

Semester: I

Date: 04-11-2024

Course Code: MAT2007

Time: 09:30am – 11:00am

Course Name: APPLIED MATHEMATICS

Max Marks: 50

Program: BCA

Weightage: 25%

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.

5Qx2M=10M

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|----------|--|---------|----|-----|
| 1 | Identify the inverse of $A = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ | 2 Marks | L1 | C01 |
| 2 | Identify the determinant of matrix $A = \begin{bmatrix} 3 & 0 & 6 \\ 6 & 3 & 0 \\ 9 & 6 & 3 \end{bmatrix}$ | 2 Marks | L1 | C01 |
| 3 | Describe the Singular and non-singular matrices. | 2 Marks | L1 | C01 |
| 4 | Find the sum and its magnitude of the vectors
$a = 3i + j + 4k$, and $b = i - j + k$. | 2 Marks | L1 | C02 |
| 5 | If either vector $a = 0$ or $b = 0$, then $a \cdot b = 0$. But the converse need not be true. Justify your answer with an example. | 2 Marks | L1 | C02 |

Part B

Answer ALL Questions. Each question carries 10 marks.

4QX10M=40M

6a. Find the Rank of the Matrix $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ by reducing into Row Echelon form. 6 Marks L3 C01

6. Compute AB and BA for the Matrices 4 Marks L2 C01

6b. $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & -2 & 4 \\ -2 & 1 & 1 \\ 4 & 1 & 0 \end{bmatrix}$

OR

Determine the inverse of the matrix 8 Marks L3 C01

7. **7a.** $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$

7b. Define the diagonal matrix and give an example. 2 Marks L1 C01

8 Apply Gauss Elimination method to solve the system of equations 10 Marks L3 C01

$$x + y + z = 9, x - 2y + 3z = 8, 2x + y - z = 3.$$

OR

9 Apply Gauss Jordan method to solve the system of equations 10 Marks L3 C01

$$2x + y + 4z = 12, 4x + 11y - z = 33, 8x - 3y + 2z = 20.$$

10a. Find the vector equation and the cartesian form of the line joining the points $2i + j + 3k$ and 6 Marks L3 C02

10 $-4i + 3j - k.$

10b. Find the angle between the vectors $a = i - 2j + 3k$, and $b = 3i - 2j + k.$ 4 Marks L2 C02

OR

- 11a.** Find the vector equation and cartesian form of the line passing through the point $2i + 3j + k$ and parallel to the vector $4i - 2j + 3k$. 6 Marks L3 CO2
- 11.** **11b.** Let $a = 2i + 4j - 5k$, $b = i + j + k$, and $c = j + 2k$. Find the unit vector in the direction of $a + b + c$ and also find unit vector in the opposite direction of $a + b + c$. 4 Marks L2 CO2
- 12.** **12a.** If $a = 5i - j - 3k$, and $b = i + 3j - 5k$, then show that the vectors $a + b$ and $a - b$ are perpendicular to each other. 4 Marks L2 CO2
- 12b.** Find the direction cosines for the following vectors: 6 Marks L3 CO2
- $$a = 2i - j + k$$
- $$b = i - 3j - 5k$$

OR

- 13a.** Find the cofactor matrix of $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$ 4 Marks L3 CO1
- 13.** **13b.** Define symmetric and skew-symmetric matrices with examples. 4 Marks L1 CO1
- 13c.** Define orthogonal matrix and give example 2 Marks L2 CO1