Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (AI & DS / AI & ML / Block Chain / CE / CSE / CS / DS / CSD / EE / EEE / ETE / FT / IT / ME / Robotics & Artificial Intelligence / Internet of Things and Cyber Security including Block Chain Technology) (Sem.–2)

ENGINEERING MATHEMATICS-II

Subject Code : BTAM201/23

M.Code : 93811

Date of Examination : 09-06-2024

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :

(a) Reduce in echelon form : $A = \begin{pmatrix} 1 & 3 & 2 \\ 1 & 6 & 1 \\ 2 & 3 & 6 \end{pmatrix}$

(b) State Cayley-Hamilton theorem.

(c) Determine the value of k for which the homogeneous system of equations : $x - ky + z = 0;\ kx + 3y - \mathrm{k}z = 0;\ 3x + y - z = 0$ has only trivial solution.

(d) Determine the eigen values of the matrix $\begin{pmatrix} 1 & 4 \\ 3 & 2 \end{pmatrix}$.

(e) $T : \mathbb{R} \to \mathbb{R}^2$ defined by $T(x) = (2x, 3x)$. Check whether T is a Linear Transformation or not.

(f) Check the exactness of the differential equation : $e^x(\cos y\, dx - \sin y\, dy) = 0$.

(g) Solve the following differential equation $\sin x \dfrac{dy}{dx} + y \cos x = \cos x \sin^2 x$.

(h) Check whether the Differential equation $y'' + yx^3 = 0$ is Linear and Non-linear?

(i) Solve the partial differential equation $(4D^3 - 3DD'^2 + D'^3)\, z = 0$.

(j) Eliminate the arbitrary constants a and b from $z = ax + by + a^2b^2$, to obtain the partial differential equation governing it.

SECTION-B

2. Solve the system of linear equations : $x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2$, using inverse of a matrix.

3. Use Gauss-Jordon method to find the inverse of the matrix $A = \begin{bmatrix} 0 & 2 & 1 & 3 \\ 1 & 1 & -1 & -2 \\ 1 & 2 & 0 & 1 \\ -1 & 1 & 2 & 6 \end{bmatrix}$.

4. For the linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^3$, defined by, $T(x, y) = (x + y, x - y, y)$, find a basis and dimension of (*i*) its range space and (*ii*) its null space. Hence verify rank-nullity theorem.

5. Let T be a linear operator on $\mathbb{R}^2$ defined by $T(x, y) = (4x - 2y, 2x + y)$.

(a) Find the matrix T relative to basis $B = \{(1, 1), (-1, 0)\}$.

(b) Also verify that $[T : B][v : B] = [T(v) : B]$ for any vector $v \in \mathbb{R}^2$.

SECTION-C

6. Solve the differential equation $(D^2 + D + 1)\, y = \sin x$ using method of undetermined coefficients.

7. Solve $y' + 4xy + xy^3 = 0$.

8. Find the general solution of the partial differential equation $xy^2 p + y^3 q = (zxy^2 - 4x^3)$.

9. Solve $p = (qy + z)^2$ using Charpit's method.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.