KADI SERVA VISHWAVIDHYALAYA,

BE Semester-2(June_2023)

Engineering Mathematics-2(CC201-N) **Max Marks: 70**

Date: 15/06/2023 **Duration: 3hr**

Instruction: 1) Answer each section in the separate answer sheet

2) Use of a scientific calculator is permitted

3) All questions are compulsory

4). Indicate clearly, the option you attempted along with its respective question number

5) use the last page of the main supplementary for rough work.

Section-1

Q.1 (a) Verify Cauchy- Schwarz inequality for following vectors. [5]

1) u = (−3, 1, 0), v = (2, −1, 3)

2) u = (0, −5, 6), v = (4, 7, 3)

(b) Find the Non singular matrix Matrices P and Q Such That PAQ is the normal Form [5]

Where $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$

(c) Determine whether the given vectors U = (1, 0, 0), V = (1, 1, 0), W = (1, 1, 1) form basis vectors of R^3. [5]

OR

(c) Find the directional derivative of the function $f(x, y, z) = xy^2 + yz^3$ at the point (2, −1, 1) in the direction of the vector $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$. [5]

Q.2 (a) If $F = y^2\hat{\imath} + x^2\hat{\jmath} - (z + y)\hat{k}$,Evaluate $\oint_C \overline{f}\cdot\overline{dr}$ by using Stoke's theorem, where C is the boundary of the triangle with vertices (0, 0, 0), (1, 0, 0) and (1, 1, 0). [5]

(b) Find the inverse for $A = \begin{pmatrix} 2 & 6 & 6 \\ 2 & 7 & 6 \\ 2 & 7 & 7 \end{pmatrix}$ by Gauss-Jordan method. [5]

OR

(a) Find the standard matrix for the linear operator on R^2 with rotation of 90^0 followed by reflection about the line y = x. [5]

(b) Solve the following system by gauss Elimination method [5]

$x + y + 2z = 9$

$2x + 4y - 3z = 1$

$3x + 6y - 5z = 0$

Q.3 (a) Check whether the following is a linear transformation or Not. [5]

$T : R^2 \rightarrow R^2$, where $T(x, y) = (x + y, xy)$.

(b) Find eigenvalue and eigenvector for matrix $A = \begin{pmatrix} -2 & -8 & -12 \\ 1 & 4 & 4 \\ 0 & 0 & 1 \end{pmatrix}$ [5]

OR

(a) Determine the Algebraic and Geometric Multiplicity of matrix [5]

$$A = \begin{pmatrix} 1 & 2 & -3 \\ 0 & -3 & -6 \\ 0 & 0 & 0 \end{pmatrix}$$

(b) Reduce the set B = {(0, 3, 6), (-2, 6, 6), (3, -3, 3), (1, -2, 5)} to obtain the basis of vector space R^3, Where span(B) = R^3. [5]

Section-2

Q.4 (a) Determine whether the following linear transformations are one to one and onto or not. [5]

$T : R^2 \rightarrow R^3$ define by $T(x, y) = (x - y, y - x, 2x - 2y)$.

(b) If $F = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (az + x)\hat{k}$ is solenoidal, Find The value of 'a'. [5]

(c) Show that the following vectors are linearly independent. [5]

U = (1, 0, 0), V = (0, 1, 0), W = (0, 0, 1).

OR

(c) Verify Stoke's theorem for $F = (x^2 + y^2)\hat{i} - 2xy\,\hat{j}$ taken around the rectangle bounded by the lines x = a, x = −a, y = 0 and y = b. [5]

Q.5

(a) Verify the Cayley-Hamilton theorem for matrix $\begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ [5]

(b) Define Following Matrix With Example. [5]

1) Symmetric Matrix 2) Upper Triangular Matrix 3) Trace of Matrix

OR

(a) Show that the matrix $A = \begin{pmatrix} 1 & 4 & -2 \\ 0 & 2 & -1 \\ 0 & 0 & 0 \end{pmatrix}$ is diagonalizable [5]

(b) Express a vector $p(x) = 9x^2 + 8x + 7$ is a linear combination of the vector $p_1 = 4x^2 + x + 2$, $p_2 = 3x^2 - x + 1$ and $p_3 = 5x^2 + x + 2$ [5]

Q.6 (a) Using Green's theorem, Evaluate $\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundary of circle $x^2 + y^2 = a^2$ above the x-axis. [5]

(b) Find the divergence and Curl of F where $F = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$ [5]

OR

(a) Check whether $W = \{A \in M_{22} / \det(A) \neq 0\}$ is a subspace of M_{22}. [5]

(b) Prove that $r^n\,\bar{r}$ is irrotational. [5]

KADI SERVA VISHWAVIDHYALAYA,

BE Semester-2(Jan_2023)

Engineering Mathematics-2(CC201-N) **Max Marks: 70**

Date: 18/01/2023 **Duration: 3hr**

Instruction: 1) Answer each section in separate answer sheet

2) Use of scientific calculator is permitted

3) All question are compulsory

4). Indicate clearly,the option you attempted along with its respective question number

5) use the last page of main supplementary for rough work.

Section-1

Q.1 (a) Verify Cauchy- Schwarz inequality for following vectors. [5]

1) u = (−4, 2, 1), v = (8, −4, −2)

2) u = (0, −5, 6), v = (4, 7, 3)

(b) Find the rank of the matrix = $\begin{bmatrix} 1 & 2 & 3 \\ 7 & 8 & 9 \\ 4 & 5 & 6 \end{bmatrix}$ [5]

(c) Determine whether the given vectors U = (1, −1, 1), V = (0, 1, 2), W = (3, 0, 1) form basis vectors of R^3. [5]

OR

(c) Find the directional derivative of the function $f(x, y, z) = xy^2 + yz^3$ at the point (2, −1, 1) in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$. [5]

Q.2 (a) If $F = y^2\hat{i} + x^2\hat{j} - (z + y)\hat{k}$,Evaluate $\oint_C \overline{f}\ \overline{dr}$ by using Stoke's theorem, where C is the boundary of the triangle with vertices (0, 0, 0), (1, 0, 0) and (1, 1, 0). [5]

(b) Find the inverse for A = $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$ by Gauss-Jordan method. [5]

OR

(a) Evaluate $\iiint_V \overline{f}\, dv$ where $\overline{f} = 2\hat{i} + (2z)\hat{j} + y\hat{k}$ and V is the region bounded by the planes z=0, z=4 and the surface $x^2 + y^2 = 9$. [5]

(b) Solve the following system by gauss Elimination method [5]

$$2x + 2y + 2z = 0$$
$$-2x + 5y + 2z = 1$$
$$8x + y + 4z = -1$$

Q.3 (a) Check whether the following is a linear transformation [5]
$T : R^2 \to R^2$, where $T(x, y) = (x + y, x - y)$.

(b) Find eigenvalue and eigenvector for matrix $A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$ [5]

OR

(a) Determine the Algebraic and Geometric Multiplicity of matrix [5]

$$A = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$$

(b) Find a standard basis vector that can be added to the set $B = \{(1, 0, 3), (2, 1, 4)\}$ to produce a basis in R^3. [5]

Section-2

Q.4 (a) Determine whether the following linear transformations are one to one and onto. [5]
$T : R^2 \to R^3$ define by $T(x, y) = (x, y, x + y)$.

(b) Prove that r^{n+1} is irrotational. [5]

(c) Show that the following vectors are linearly independent. [5]
$U = (1, 0, 0)$, $V = (1, 1, 0)$, $W = (1, 1, 1)$.

OR

(c) Verify Stoke's theorem for $F = (x^2 + y^2)\,\hat{i} - 2xy\,\hat{j}$ taken around the rectangle bounded by the lines $x = a$, $x = -a$, $y = 0$ and $y = b$. [5]

Q.5

(a) Verify the Cayley-Hamilton theorem for matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{pmatrix}$ [5]

(b) Find non singular matrices P and Q such that P AQ is in the normal form where [5]

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{pmatrix}.$$

OR

(a) Show that the matrix $A = \begin{pmatrix} 1 & 3 & -2 \\ 0 & 2 & -1 \\ 0 & 0 & 5 \end{pmatrix}$ is diagonalizable [5]

(b) Determine whether the vectors $U = (2, 2, 2)$, $V = (0, 0, 3)$, $W = (0, 1, 1)$ span vector space R^3. [5]

Q.6 (a) Using Green's theorem, Evaluate $\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundery of circle $x^2 + y^2 = a^2$ above the x-axis. [5]

(b) Find the divergence and Curl of F where $F = xz^3\,\hat{i} - 2x^2yz\,\hat{j} + 2yz^4\,\hat{k}$ [5]

OR

(a) Check whether set $V = R^2$ is a vector space with respect to the operation [5]
$(x_1, x_2) + (y_1, y_2) = (x_1 + y_1 - 2, x_2 + y_2 - 3)$ and
$k(x_1, x_2) = (kx_1 + 2k - 2, kx_2 - 3k + 3)$, where $k \in R$.

(b) A fluid motion is given by $F = (y + z)\,\hat{i} + (z + x)\,\hat{j} + (x + y)\,\hat{k}$ then show that the motion is irrotational and hence find its scalar potential. [5]

Enroll. /Temp Id No.

KADI SARVA VISHWAVIDYALAYA
LDRP INSTITUTE OF TECHNOLOGY & RESEARCH, GANDHINAGAR
B.E. MID-SEMESTER EXAMINATION MAY 2023

Date:15/05/23 **Branch: All**

Subject Name &Code: Engineering Mathematics II(CC201-N) **Semester: II**

Time:1:30 pm to 3:00 pm **Max. Marks: 30**

Instructions:
1) All questions are **compulsory**.
2) Figures to the **right** indicate full marks.
3) Indicate **clearly**, the options you attempt along with its respective question number.
4) Use the last page of main supplementary for **rough work**.

Ma

Q.1 **(A)** Using Gauss-Jordan method find inverse of matrix for following matrix [5

$$A = \begin{bmatrix} 2 & 6 & 6 \\ 2 & 7 & 6 \\ 2 & 7 & 7 \end{bmatrix}.$$

(B) Find the rank and nullity of the following matrix $A = \begin{bmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{bmatrix}$. [5

Q.2 **(A)** Determine whether the vectors $V_1 = (2,-1,3), V_2 = (4,1,2), V_3 = (8,-1,8)$ span vector space R^3. [5

(B) Find the divergence and curl of the vector $\bar{F} = xyz\hat{\imath} + 3x^2y\hat{\jmath} + (xz^2 - y^2z)\hat{k}$ at the point $(-2,2,3)$. [5

OR

Q.2 **(A)** State Cauchy-Schwarz inequality and Verify Cauchy-Schwarz inequality for following vectors $u = (-3,1,0)$ and $v = (2,-1,3)$. [5

(B) Check whether the set V of all pairs of real numbers of the form $(1,x)$ with operations $(1,x) + (1,y) = (1,x+y)$ *and* $k(1,x) = (1,kx)$ is a vector space or not. [5

Q.3 **(A)** Solve the following system of equations by Gauss Elimination Method. [:

$x - y + 2z = 3$
$x + 2y + 3z = 5$
$3x - 4y - 5z = -13$

(B) Determine whether the given transformation is linear transformation or not, where $T: R^2 \to R^3$ defined by $T(x,y) = (x+y, xy)$. [5]

OR

Q.3 **(A)** Evaluate $\int_C \vec{F} \cdot \overrightarrow{dr}$, where $\vec{F} = (x^2 + y^2)\hat{\imath} - 2xy\hat{\jmath}$ and C is the rectangle in xy plane bounded by $x = 0, x = a, y = 0$ and $y = b$. [5]

(B) Find the eigen values and vectors for the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. [5]

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Exam Seat no. ....

KADI SARVA VISHWAVIDHYALAYA,

Gandhinagar

BE Semester–II (July-2022)

Engineering Mathematics II(CC201-N)

Date: 04/07/22

Max Marks: 70
Duration: 3 hr.

Instruction: 1) Answer each section in separate Answer sheet.
2) Use of Scientific calculator is permitted.
3) All questions are compulsory.
4) Indicate clearly, the options you attempt along with its respective question number.
5) Use the last page of main supplementary for rough work.

Section- I

Q.1 (a) Find the rank and nullity of the following matrix $\begin{bmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{bmatrix}$. [5]

(b) Find the directional derivative of $\emptyset(x,y,z) = 4xz^3 - 3x^2y^2z$ at the point $P(2,-1,2)$ in the direction $2\hat{\imath} + 3\hat{\jmath} + 6\hat{k}$. [5]

(c) Determine whether the vectors $v_1 = (2,-1,3), v_2 = (4,1,2), v_3 = (8,-1,8)$ span vector space $\mathbb{R}^3$. [5]

OR

(c) Apply Green's theorem, evaluate $\oint_c [(y - sinx)dx + cosxdy]$, where C is the plane triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $y = \frac{2}{\pi}x$. [5]

Q.2 (a) Express the matrix $A = \begin{bmatrix} 1 & 5 & 7 \\ -1 & -2 & -4 \\ 8 & 2 & 13 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix. [5]

(b) Check whether the given set of vectors $v_1 = (-2,0,1), v_2 = (3,2,5), v_3 = (6,-1,1)$, $v_4 = (7,0,-2)$ is linearly independent or not. [5]

OR

(a) Check whether $W = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \in M_{22}\ where\ a + b + c + d = 0 \right\}$ is a subspace of M_{22}. [5]

(b) Find the kernel and range of the following linear transformation $T: R^2 \to R^2$ defined by $T(x,y) = (2x - y, -8x + 4y)$. [5]

Q.3 (a) Evaluate $\int_C \vec{F} \cdot \vec{dr}$, where $\vec{F} = y^2\hat{\imath} + 2xy\hat{\jmath}$, where (i) C is the straight line from $(0,0)\ to\ (1,2)$ (ii) C is the parabola $y = 2x^2$ from $(0,0)\ to\ (1,2)$. [5]

(b) Find the basis for row space and column space of the following matrix $\begin{bmatrix} 1 & 4 & 5 & 2 \\ 2 & 1 & 3 & 0 \\ -1 & 3 & 2 & 2 \end{bmatrix}$. [5]

OR

(a) Determine whether the function $T: \mathbb{R}^2 \to \mathbb{R}^2$ define by $T(x,y) = (x + y, xy)$ is a linear transformation or not? [5]

(b) Check whether the set of all pair of real numbers of the form $(1,x)$ with the operations $(1,x) + (1,y) = (1,x + y)$ and $k(1,x) = (1,kx)$ is a vector space. [5]

Section -II

Q. 4 (a) Write the definition of the following with an appropriate example. (i) Identity Matrix (ii) Null Matrix (iii) Upper Triangular Matrix (iv) Orthogonal Matrix (v) Square Matrix. [5]

(b) State Cauchy-Schwarz inequality and Verify Cauchy-Schwarz inequality for following vectors $(0,-5,6)$ *and* $(4,7,3)$. [5]

(c) Solve the following system of equations by Gauss Elimination method. [5]

$$3x + 2y + z = 3$$
$$2x + y + z = 0$$
$$6x + 2y + 4z = 6$$

OR

(c) Find the velocity and acceleration of a particle which moves along the curve $x = 2sin3t,\ y = 2cos3t,\ z = 8t$ at any given time $t > 0$. Also find the magnitude of velocity and acceleration. [5]

Q. 5 (a) Verify the Cayley-Hamilton theorem for matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ and also find A^{-1}. [5]

(b) Prove that $\vec{F} = (y^2cosx + z^3)\hat{\imath} + (2ysinx - 4)\hat{\jmath} + 3xz^2\hat{k}$ is irrotational and find its scalar potential. [5]

OR

(a) Using Stokes's theorem evaluate $\int_C \vec{F} \cdot \vec{dr}$ for $\vec{F} = xy^2\hat{\imath} + y\hat{\jmath} + z^2x\hat{k}$ for the surface of rectangular lamina bounded by $x = 0, y = 0, x = 1, y = 2, z = 0$. [5]

(b) Determine Algebraic and Geometric multiplicity of each eigen values of the following matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$. [5]

Q. 6 (a) Using Gauss-Jordan method find inverse of matrix for following square matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$. [5]

(b) Find Eigen values and Eigen vectors of the following matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. [5]

OR

(a) Check if the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalizable or not. If diagonalizable then find modal matrix P and diagonal matrix D. [5]

(b) Find the standard matrix of a rotation of 45° about the $y - axis$, followed by a dilation with the factor $k = 2\sqrt{2}$ of linear operators R^3. [5]

All the best

Enroll. /Temp Id No. : 26

KADI SARVA VISHWAVIDYALAYA
LDRP INSTITUTE OF TECHNOLOGY & RESEARCH, GANDHINAGAR
B.E. MID-SEMESTER EXAMINATION MAY 2022

Date: 30/05/22

Subject Name &Code: Engineering Mathematics II(CC201-N) **Branch: All**

Time: 9:30 am to 11:00 am **Semester: II**

Max. Marks: 30

Instructions: 1) All questions are **compulsory**.
2) Figures to the **right** indicate full marks.
3) Indicate **clearly**, the options you attempt along with its respective question number.
4) Use the last page of main supplementary for **rough work**.

Marks

Q.1 **(A)** Write the definition of the following with an appropriate example. [5]
(1) Square Matrix (2) Transpose of a Matrix (3) Symmetric Matrix (4) Null Matrix (5) Singular Matrix.

(B) Find the rank of the following matrix by reducing it into row echelon form. [5]

$$A = \begin{bmatrix} 3 & 3 & -4 \\ 1 & 1 & -1 \\ 2 & 1 & -3 \end{bmatrix}.$$

Q.2 **(A)** Find the velocity and acceleration of a particle which moves along the curve $x = 2sin3t, y = 2cos3t, z = 8t$ at any given time $t > 0$. Also find the magnitude of velocity and acceleration. [5]

(B) Determine whether the set R^+ of all positive real numbers with operations $x + y = xy$ and $kx = x^k$ is a vector space. [5]

OR

Q.2 **(A)** State Cauchy-Schwarz inequality and Verify Cauchy-Schwarz inequality for following vectors $u = (-3,1,0)$ and $v = (2,-1,3)$. [5]

(B) Determine whether the following set of vectors $S = \{(1,1,1), (1,2,3), (2,-1,1)\}$form a basis for R^3 or not. [5]

Q.3 **(A)** Using Gauss-Jordan method find inverse of matrix for following matrix [5]

$$A = \begin{bmatrix} 2 & 6 & 6 \\ 2 & 7 & 6 \\ 2 & 7 & 7 \end{bmatrix}.$$

(B) Find the angle between the following vectors $u = (2,-1,3)$ and $v = (2,5,-5)$. [5]

OR

Q.3 **(A)** Investigate for what values of λ and μ the equations $x + 2y + z = 8$, $2x + 2y + 2z = 13, 3x + 4y + \lambda z = \mu$ have (i) no solution (ii) unique solution (iii) many solutions. [5]

(B) Express a vector $p(x) = 9x^2 + 8x + 7$ is a linear combination of vectors $p_1 = 4x^2 + x + 2, p_2 = 3x^2 - x + 1$ and $p_3 = 5x^2 + x + 2$. [5]