Name: …… Admission No: ……

ABES Institute of Technology, Ghaziabad

Subject Code: BAS103

Subject Name: Engineering Mathematics-I

Year - 1st, Branch-All

3rd ASSIGNMENT (ODD SEMESTER 2024-25)

[Time: 1 Hours] **[Total Marks: 10]**

COURSE OUTCOMES

CO	Statements
1	***Understand*** **the concept of complex matrices, Eigen values, Eigen vectors and *apply* the concept of rank to *evaluate* linear simultaneous equations.**

(SET-A)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	***Show*** that the matrix A is Hermitian where $A=\begin{bmatrix}2 & 3+2i & -4\\ 3-2i & 5 & 6i\\ -4 & -6i & 3\end{bmatrix}$.	1
b.	***Show*** that the matrix $\begin{bmatrix}\alpha+i\gamma & -\beta+i\delta\\ \beta+i\delta & \alpha-i\gamma\end{bmatrix}$ is unitary if $\alpha^2+\beta^2+\gamma^2+\delta^2=1$.	1

SECTION-B

Q.2	Attempt two Questions. (2x3=6)	CO
a.	If $A=\begin{bmatrix}1 & 0 & 0\\ 1 & 0 & 1\\ 0 & 1 & 0\end{bmatrix}$, ***calculate*** A^{-1} & A^{-2} by using Cayley-Hamilton Theorem.	1
b.	***Find*** eigen value and eigen vector for the matrix $A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$.	1
c.	***Express*** $A=\begin{bmatrix}i & 2-3i & 4+5i\\ 6+i & 0 & 4-5i\\ -i & 2-i & 2+i\end{bmatrix}$ as sum of a Hermitian & Skew-Hermitian matrices.	1

SECTION-C

Q.3	Attempt one Questions. (1x3=3)	CO
a.	***Prove*** that the system of linear equations $-2x+y+z=a,\ x-2y+z=b,\ x+y-2z=c$ have no solution unless $a+b+c=0$.	1
b.	***Solve*** the equations using matrix method: $x_1+3x_2+2x_3=0$, $2x_1-x_2+3x_3=0$, $3x_1-5x_2+4x_3=0$, $x_1+17x_2+4x_3=0$	1

(SET-B)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	***Show*** that the matrix iA is Skew-Hermitian where $A=\begin{bmatrix}2 & 3+2i & -4\\ 3-2i & 5 & 6i\\ -4 & -6i & 3\end{bmatrix}$.	1
b.	***Show*** that matrix A is unitary where $A=\begin{bmatrix}\frac{1+i}{2} & \frac{-1+i}{2}\\ \frac{1+i}{2} & \frac{1-i}{2}\end{bmatrix}$.	1

SECTION-B

Q.2	Attempt two Questions. (2x3=6)	CO
a.	If $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 4 & 5\\ 3 & 5 & 6\end{bmatrix}$, then ***express*** the polynomial $B=A^8-11A^7-4A^6+A^5+A^4-11A^3-3A^2+2A+I$ as a quadratic polynomial in A. Hence ***find*** the value of B by Cayley-Hamilton theorem.	1
b.	***Find*** eigen values and eigen vectors of the Matrix $A=\begin{bmatrix}3 & 10 & 5\\ -2 & -3 & -4\\ 3 & 5 & 7\end{bmatrix}$.	1
c.	***Express*** $A=\begin{bmatrix}1+i & 2 & 5-5i\\ 2i & 2+i & 4+2i\\ -1+i & -4 & 7\end{bmatrix}$ as sum of a Hermitian & Skew-Hermitian matrices.	1

SECTION-C

Q.3	Attempt one Questions. (1x3=3)	CO
a.	***Solve*** the system of linear equations $4x_1+3x_2-x_3=0$, $3x_1+4x_2+x_3=0$, $x_1-x_2-2x_3=0$, $5x_1+x_2-4x_3=0$	1
b.	***Prove*** that the system of linear equations $3x+4y+5z=a, 4x+5y+6z=b, 5x+6y+7z=c$ will have no solution unless $2b=a+c$.	1