

Group 5	1. Find the Eigen Values and Eigen Vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 2. Reduce the matrix $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ to normal form and hence find its rank. 3. Test for Consistency and hence solve $x + y + z = 9, 2x + 5y + 7z = 52, 2x + y - z = 0.$
Group 6	1. Find the eigenvalue and eigenvector of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ 2. If A is hermitian matrix then prove that iA is a skew-hermitian. 3. Find the sum and product of eigen value of matrix $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}.$
Group 7	1. Find P such that $P^{-1}AP$ is diagonal matrix where $A = \begin{bmatrix} 3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$ 2. Reduce the Matrix to diagonal form, $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ 3. Show that every square matrix is expressible as the sum of a symmetric matrix and a skew-symmetric matrix.
Group 8	1. Find the value of k if vectors $\begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix}$ and $\begin{bmatrix} k \\ 0 \\ 1 \end{bmatrix}$ are linearly dependent. 2. For the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$, Find non-singular matrices P & Q such that PAQ is in the normal form. 3. Diagonalize the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ and obtain its modal matrix.
Group 9	1. Test the consistency and solve $2x - 3y + 7z = 5, 3x + y - 3z = 13, 2x + 19y - 47z = 32.$ 2. Find the latent root and latent vector of the matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$ 3. Use Gauss Jordan method to find the inverse of $A = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}.$
Group 10	1. Discuss the consistency of the following system of equations. $x + 2y + 3z = 0, 3x + 4y + 4z = 0, 7x + 10y + 12z = 0.$ 2. Find rank of the following matrix $A = \begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$ 3. Are the following vectors L.D. if so find the relation between them $(2, 1, 1), (2, 0, -1), (4, 2, 1)$



Group	Problems
Group 1	1. For what values of λ and μ do the system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ have a) no solution b) unique solution c) more than one solution. 2. Prove that the matrix $\begin{bmatrix} -\frac{2}{3} & \frac{1}{3} & \frac{1}{3} \\ \frac{2}{3} & \frac{2}{3} & \frac{1}{3} \\ \frac{1}{3} & -\frac{2}{3} & \frac{2}{3} \end{bmatrix}$ is orthogonal. 3. Diagonalize the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ and obtain its modal matrix.
Group 2	1. Reduce the following matrices to the Normal form and hence find its rank $\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ -1 & -2 & 6 & -7 \end{bmatrix}$. 2. Test the consistency & Solve $5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 11z = 5$. 3. Verify that the matrix $A = \begin{bmatrix} \cos \theta & 0 & \sin \theta \\ 0 & 1 & 0 \\ \sin \theta & 0 & \cos \theta \end{bmatrix}$ is orthogonal or not.
Group 3	1. Test for Consistency and hence solve $x + y + z = 9, 2x + 5y + 7z = 52, 2x + y - z = 0$ 2. Show that column vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ -2 & 1 & 2 \end{bmatrix}$ are linearly dependent 3. Show that matrix A is not diagonalizable where $A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$
Group 4	1. For what value of K will the following equation fail to have unique solution $3x - y + Kz = 1, 2x + y + z = 2, x + 2y - Kz = -1$ will the equation have any solution for these values of K. 2. Find the inverse of the $\begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}$ using Gauss Jordan method. 3. Determine the Rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$.

Q1. Find modulus and argument of
a) $1 + \cos \theta + i \sin \theta$ b) $\frac{1+3i}{1-2i}$ c) $\frac{2+i6\sqrt{3}}{5+i\sqrt{3}}$

Q2. Find all values of $x^7 + i = 0$

Q3. If $\cos \alpha + \cos \beta + \cos \gamma = \sin \alpha + \sin \beta + \sin \gamma = 0$ then prove that

a) $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 0$

b) $\sin 2\alpha + \sin 2\beta + \sin 2\gamma = 0$

Q4. Find real and imaginary part of $\log(\sin z)$

Q5. If $\tan(x+iy) = \sin(u+iv)$, then show that
$$\frac{\sin 2x}{\sinh 2y} = \frac{\tan u}{\tan v}$$

Q6. Sum the following series

$$\sin \alpha + \frac{\sin 2\alpha}{2!} + \frac{\sin 3\alpha}{3!} + \frac{\sin 4\alpha}{4!} + \dots \infty$$

Q7. Show that

i) $\log(1+i\tan \alpha) = \log \sec \alpha + i\alpha$

ii) $\operatorname{Log}_e\left(\frac{3-i}{3+i}\right) = 2i\left(n\pi - \tan^{-1}\frac{1}{3}\right)$

Q8. separate real & imaginary parts of

i) $\tan(x+iy)$ ii) $\coth(x+iy)$ iii) $\operatorname{cosech}(x+iy)$

Unit -2

Sr. No.	Question
1	Find the cube roots of unity.
2	Prove that $(\sqrt{3} + i)^n + (\sqrt{3} - i)^n = 2^{n+1} \cos \frac{n\pi}{6}$.
3	If $\sin \alpha + \sin \beta + \sin \gamma = \cos \alpha + \cos \beta + \cos \gamma = 0$ then prove that (i) $\sin 3\alpha + \sin 3\beta + \sin 3\gamma = 3\sin(\alpha + \beta + \gamma)$ (ii) $\sum \sin(\beta + \gamma) = 0$ (iii) $\sum \sin 2\alpha = 0$
4	If $u = \log \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$; prove that $\tanh \frac{u}{2} = \tan \frac{\theta}{2}$
5	Separate real and imaginary part of the following (i) $\log(\log i)$ (ii) $\tan^{-1}(x + iy)$
6	Find modulus and argument of $(1 + i)^{1-i}$.

7	Simplify $\left[\frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \right]^4$.
8	Prove that $\log(-4) = 2 \log 2 + (2n+1)\pi i$.
9	If $x_r = \cos \frac{\pi}{2^r} + i \sin \frac{\pi}{2^r}$, prove that $x_1 x_2 x_3 \dots \infty = -1$

10	$x = \cos \alpha + i \sin \alpha$, $y = \cos \beta + i \sin \beta$, prove that $\frac{x-y}{x+y} = i \tan \frac{\alpha-\beta}{2}$. If
11	. Separate real and imaginary part of the following (i) $e^{(5+3i)^2}$ (ii) $\sec(x+iy)$ (iii) $\log \sin(x+iy)$
12	Show that $\log \frac{x+iy}{x-iy} = 2i \tan^{-1} \frac{y}{x}$

Group	Problems
Group 1	1. Solve: $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$ 2. Solve: $y'' - 2y' + y = xe^x \sin x$ 3. Solve: $(D^2 - 4D + 3)y = e^x \cos 2x$
Group 2	1. Solve: $y(xy + 2x^2y^2)dx + x(xy - x^2y)dy = 0$. 2. Solve: $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ 3. Solve: $(2x^2y^2 + y)dx + (3x - x^3y)dy = 0$
Group 3	1. Solve: $(D^2 - 4D + 3)y = e^x \cos 2x$ 2. Solve: $y''' - y'' + 4y' - 4y = \sin 3x$ 3. Solve: $(x^2 + y^2 + x)dx + xydy = 0$.
Group 4	1. Solve: $\frac{dy}{dx} + \frac{y \log y}{x} = \frac{y(\log y)^2}{x^2}$ 2. Solve: $(1 + y^2)dx = (\tan^{-1} y - x)dy$ 3. Solve: $(D^2 - 4D + 3)y = \sin 3x \cos 2x$
Group 5	1. Solve: $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10 \left(x + \frac{1}{x}\right)$ 2. Find the I.F of the differential equation $(y - 1)dx - xdy = 0$ and hence solve it. 3. Solve: $\frac{dx}{dt} + 4x + 3y = t$, $\frac{dy}{dt} + 2x + 5y = e^t$
Group 6	1. Solve: $\frac{dx}{dt} + 2y = e^t$, $\frac{dy}{dt} - 2x = e^{-t}$ 2. Solve: $(3x + 2)^2 y'' + 3(3x + 2)y' - 36y = 3x^2 + 4x + 1$ 3. Solve: $x^2 y'' + 3xy' + y = \frac{1}{(1-x)^2}$
Group 7	1. Solve: $x^2 y'' - 4xy' + 8y = 4x^3 + 2 \sin(\log x)$ 2. Solve: $(1 + x)^2 y'' + (1 + x)y' + y = \sin[2 \log(1 + x)]$ 3. Solve: $(D^2 - 6D + 13)y = 8e^{3x} \sin 4x + 2^x$
Group 8	1. Solve: $(D^2 + 5D + 4)y = x^2 + 7x + 9$

	2. Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^{2x} + 10\sin 3x$ given $y(0) = 2$, $y'(0) = 4$ 3. Solve: $(D^2 - 4D + 3)y = 2xe^{3x} + 3e^{3x}\cos 2x$
Group 9	1. Solve: $(D^2 + D + 1)y = (1 + \sin x)^2$ 2. Solve: $y^{iv} - y = \cos x \cosh x$ 3. Solve: $y'' + 3y' + 2y = e^{e^x}$
Group 10	1. Solve: $(D^3 + 2D^2 + D)y = x^2e^x + \sin^2 x$ 2. Solve: $(x^4e^x - 2mxy^2)dx + 2mx^2ydy = 0$. 3. Solve: $y'' + 4y = x \sin 2x$



THE ASCENT CIRCLE

JOIN US FOR NOTES , UPDATES , OFFICIAL NOTIFICATIONS
AND MUCH MORE.... 🤔 🤔

WHATSAPP LINK: [JOIN US](#)