22CHU206N / 22CHU206

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(Second Semester)

Branch - **CHEMISTRY**

MATHEMATICS – II FOR CHEMISTRY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	If $\lambda_1, \lambda_2, \lambda_3, \ldots \lambda_n$ are eigen values of matrix A, then the eigen values of the inverse matrix are (a) $\lambda_1, \lambda_2, \lambda_3, \ldots \lambda_n$ (b) $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \frac{1}{\lambda_3}, \ldots, \frac{1}{\lambda_n}$ (c) $\lambda_1^2, \lambda_2^2, \lambda_3^2, \ldots, \lambda_n^2$ (d) $k\lambda_1, k\lambda_2, k\lambda_3, \ldots k\lambda_n$	K1	CO1
	2	The sum of the elements on the _____of the matrix is the sum of the eigenvalues of the matrix. (a) inverse (b) rank (c) diagonal (d) determinant	K2	CO2
2	3	If $x = cos\theta + isin\theta$ then $\left(x + \frac{1}{x}\right)^n$ =_____ (a) $2^n i^n sin^n\theta$ (b) $2^n sin^n\theta$ (c) $2^n cos^n\theta$ (d) $2^n i^n cos^n\theta$	K1	CO1
	4	If n is odd, then the number of terms in the expansion of $\left(x + \frac{1}{x}\right)^n$ is _____ (a)n (b)n+1 (c) n-1 (d) n+2	K2	CO2
3	5	The solution of $x + y\frac{\partial z}{\partial x} = 0$ is _____ (a) $z = -\frac{x^2}{2y} + \emptyset(y)$ (b) $z = -\frac{y^2}{2x} + \emptyset(y)$ (c) $z = \frac{y^2}{2x} + \emptyset(y)$ (d) $z = \frac{x^2}{2y} + \emptyset(y)$	K1	CO1
	6	The partial differential equation of the form $z = px + qy + f(p, q)$ is known as _____ (a)Lagrange equation (b) Charpits equation (c)Clairaut's equation (d) Jacobi equation	K2	CO2
4	7	If $L(t^n) = \frac{n!}{s^{n+1}}$, n is a positive integer, then $L(e^{-at}t^n)$ = _____ (a) $\frac{n!}{(s+a)^n}$ (b) $\frac{n!}{(s-a)^n}$ (c) $\frac{n!}{(s-a)^{n+1}}$ (d) $\frac{n!}{(s+a)^{n+1}}$	K1	CO1
	8	The value of $L^{-1}\left[\frac{1}{(s+a)^2}\right]$ is _____ (a) $e^{at}t$ (b) $e^{-at}t$ (c) $e^{at}\frac{1}{t}$ (d) $e^{-at}\frac{1}{t}$	K2	CO2
5	9	If $f(x)$ is an even function then the value of the Fourier co-efficient b_n = _____ (a)1 (b) 0 (c) π (d) $\frac{\pi}{2}$	K1	CO1
	10	If $f(x)$ is even then $\int_{-a}^{a} f(x)dx$ = _____ (a) $2\int_{-a}^{0} f(x)dx$ (b)$2\int_{0}^{a} f(x)dx$ (c)0 (d) $\int_{0}^{a} f(x)dx$	K2	CO1

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SECTION - B (35 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find the eigenvalues and eigenvector of the matrix $A = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.	K3	CO1
		(OR)		
	11.b.	Verify Cayley-Hamilton theorem for $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$.	K3	CO1
2	12.a.	Prove that $sin^7\theta = \frac{-1}{64}[sin7\theta - 7sin5\theta + 21sin3\theta - 35sin\theta]$.	K3	CO4
		(OR)		
	12.b.	Prove that $cos8\theta = 1 - 32sin^2\theta + 160sin^4\theta - 256sin^6\theta + 128sin^8\theta$.	K3	CO4
3	13.a.	Solve $z^4q^2 - z^2p = 1$.	K3	CO4
		(OR)		
	13.b.	Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$ given that when $x = 0, \frac{\partial z}{\partial x} = asiny$ and $\frac{\partial z}{\partial y} = 0$.	K3	CO4
4	14.a.	Evaluate $\int_0^\infty \frac{e^{-t} - e^{-2t}}{t} dt$.	K4	CO3
		(OR)		
	14.b.	Find $L^{-1}\left[\frac{s+2}{(s^2+4s+5)^5}\right]$.	K4	CO3
5	15.a.	Express $f(x) = \frac{1}{2}(\pi - x)$ as a Fourier series with period 2π, to be valid in the interval 0 to 2π.	K2	CO1
		(OR)		
	15.b.	Show that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$ in the interval $(-\pi \le x \le \pi)$.	K2	CO1

SECTION -C (30 Marks)

Answer **ANY THREE** questions
ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Diagonalize the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$.	K4	CO4
2	17	Evaluate: (i) $\lim_{x\to 0} \frac{x - sinx}{x^3}$. (ii) $\lim_{\theta\to 0} \frac{tan\theta - sin\theta}{\theta^3}$.	K4	CO5
3	18	(i) Eliminate a and b from $z = (x + a)(y + b)$. (ii) Solve the equation $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial z}{\partial x} + 3z = e^{2x}$.	K5	CO5
4	19	(i) Find $L^{-1}\left[\frac{1}{s(s+a)}\right]$. (ii)Find $L^{-1}\left[\frac{1}{(s+1)(s^2+2s+2)}\right]$.	K4	CO3
5	20	If $f(x) = -x \ in -\pi < x < 0$ $= x \quad in\ 0 \le x < \pi$ expand f(x) as Fourier series in the interval $-\pi$ to π. Deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots$	K5	CO2

Z-Z-Z END