25CHU103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch - **CHEMISTRY**

MATHEMATICS – I 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	The determinant of the identify matrix of order 3 is A) 0 B) 1 C) 2 D) 3	K1	CO1
	2	If eigen values of a matrix are $2, -1, 3$, then its trace is A) 6 B) 4 C) 2 D) 0	K2	CO1
2	3	Derivative of $tanx$ is A) sec^2x B) cos^2x C) $-cos^2x$ D) sin^2x	K1	CO2
	4	Jacobian of $u = x + y, v = x - y$ w.r.to (x, y) is A) 0 B) 1 C) -2 D) -2	K2	CO2
3	5	Hessian determinant is used in A) Single variable calculus B) ODE C) Maxima/Minima of two variables D) Integration	K1	CO3
	6	If $D = f_{xx}f_{yy} - (f_{xy})^2 < 0$, the point is A) Maximum B) Minimum C) Saddle point D) Cannot say	K2	CO3
4	7	Equation $dy/dx + ycosx = sinx$ is A) Linear ODE B) Exact ODE C) Non-linear ODE D) None	K1	CO4
	8	Bernoulli's equation can be reduced to A) Exact ODE B) Linear ODE C) Non-linear ODE D) None	K2	CO4
5	9	Gauss–Jordan eliminates coefficients to A) Diagonal form B) Identity matrix C) Upper triangular D) None	K1	CO5
	10	For convergence of Gauss–Seidel, diagonal dominance is A) Necessary B) Sufficient C) Necessary & sufficient D) Not required	K2	CO5

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.	Verify Cayley Hamilton theorem and hence find inverse for $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$	K3	CO1
		(OR)		

Cont...

1	11.b.	Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & 1 \\ 3 & -1 \end{bmatrix}$.	K3	CO1
2	12.a.	Find $\frac{dy}{dx}$ if $3x^2 + xy - y^2 + 4x - 2y + 1 = 0$.	K3	CO2
		(OR)		
	12.b.	If $x = r\cos\theta, y = r\sin\theta$ find $\frac{\partial(x,y)}{\partial(r,\theta)}$.		
3	13.a.	Expand $e^x \cos y$ near the point $\left(1, \frac{\pi}{4}\right)$ by Taylors series as far as quadratic terms.	K3	CO3
		(OR)		
	13.b.	Find the maximum or minimum values of $x^3 + y^3 - 3axy$.		
4	14.a.	Solve the exact differential equation: $(y + 2x)dx + (x + 3y)dy = 0$.	K3	CO4
		(OR)		
	14.b.	Solve the linear differential equation: $dy/dx + 2y = e^{-x}$.		
5	15.a.	Solve the system of equations by Gauss elimination. $2x + 3y + z = 5, 4x + 4y - 3z = 3, 2x - 3y + 2z = 2$.	K4	CO5
		(OR)		
	15.b.	Solve the system of equations by Gauss Jacobi. $10x - 5y - 2z = 3, 4x - 10y + 3z = -3, x + 6y + 10z = -3$.		

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	Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.	K3	CO1
2	17	If $u = x + y + z, uv = y + z, uvw = z$ then show that $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2 v$.	K3	CO2
3	18	Expand $e^x \log(x + y)$ in powers of x and y as far as terms of the third degree.	K3	CO3
4	19	Solve the Bernoulli's equation: $dy/dx + y/x = x^2 y^2$.	K3	CO4
5	20	Solve the system of equations by Gauss Jordan. $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$.	K4	CO5

Z-Z-Z END