

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2026
(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 eigenvalues of a triangular matrix are a) Always 0 b) Equal to diagonal elements c) Sum of diagonal elements d) None	K1	CO1
	2	The sum of eigenvalues of a matrix equals a) Rank of the matrix b) Trace of the matrix c) Determinant d) Dimension	K2	CO1
2	3	A function is differentiable only if it is a) Continuous b) Discontinuous c) Polynomial d) Rational	K1	CO2
	4	Jacobian helps in a) Differentiation b) Change of variables c) Integration only d) Finding determinant	K2	CO2
3	5	Taylor expansion of $f(x, y)$ involves a) Only first-order derivatives b) Higher-order derivatives c) Only second-order derivatives d) No derivatives	K1	CO3
	6	For a function $f(x, y)$, critical points occur when a) $f_{xx} = f_{yy} = 0$ b) $f_x = f_y = 0$ c) $f_{xy} = 0$ d) Hessian=0	K2	CO3
4	7	General solution contains a) Arbitrary constants b) No constants c) Particular values d) None	K1	CO4
	8	Exact equation condition is a) $\partial M/\partial x = \partial N/\partial y$ b) $\partial M/\partial y = \partial N/\partial x$ c) $M = N$ d) None	K2	CO4
5	9	Gauss elimination involves a) Forward elimination + back substitution b) Only elimination c) Iteration d) None	K1	CO5
	10	Advantage of iterative methods is a) Always exact b) Less storage for large system c) Fast for small system d) None	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 $\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.	K3	CO1
		(OR)		
	11.b.	Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$.		
2	12.a.	Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$.	K3	CO2
		(OR)		
	12.b.	If $x = u(1 + v)$, $y = v(1 + u)$ find $\frac{\partial(x,y)}{\partial(u,v)}$.		

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3	13.a.	Expand $e^x \sin y$ in powers of x and y as far as terms of the third degree.	K3	CO3
	(OR)			
	13.b.	Find the maximum or minimum values of $3x^2 - y^2 + x^3$.		
4	14.a.	Solve the exact differential equation: $(2xy + y^2)dx + (x^2 + 2xy)dy = 0$.	K3	CO4
	(OR)			
	14.b.	Solve the linear differential equation: $dy/dx + y = e^{-x}$.		
5	15.a.	Solve the system of equations by Gauss elimination. $x + 2y + z = 3, 2x + 3y + 3z = 10, 3x - y + 2z = 13$.	K4	CO5
	(OR)			
	15.b.	Solve the system of equations by Gauss Jacobi. $x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$.		

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 $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.	K3	CO1
2	17	If $x = u \cos \theta v, y = u \sin v$ find $\frac{\partial(r,\theta)}{\partial(x,y)} \frac{\partial(x,y)}{\partial(r,\theta)} = 1$.	K3	CO2
3	18	Find the maximum or minimum values of $2(x^2 - y^2) - x^4 + y^4$.	K3	CO3
4	19	Solve the Bernoulli's equation: $dy/dx + y = y^2 e^x$.	K3	CO4
5	20	Solve the system of equations by Gauss seidel. $10x - 5y - 2z = 3, 4x - 10y + 3z = -3, x + 6y + 10z = -3$.	K4	CO5

Z-Z-Z

END