22BCU208N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Branch - **BIOCHEMISTRY**

MATHEMATICS

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 an identity matrix of any order are: A) All ones B) All zeros C) All negative ones D) Cannot be determined	K1	CO1
	2	The characteristic polynomial of a matrix $A$is defined as: A) $\det(A+\lambda I)$ B) $\det(A)$ C) $\det(A-\lambda I)$ D) Trace(A)	K2	CO1
2	3	If the sum of the roots of of $x^3-px^2+qx+r=0$, then pq is A) r^2 B) $\frac{1}{r^2}$ C) $\frac{1}{r}$ D) r	K1	CO2
	4	The product of the roots of the equation $x^3-3x^2+3x-1=0$ is A) 3 B) -1 C) 1 D) -3	K2	CO2
3	5	Which step is performed first in the Gauss Elimination method? A) Back substitution B) Matrix inversion C) Forward elimination D) Row swapping	K1	CO3
	6	Both Jacobi and Gauss-Seidel methods are classified as A) Direct methods B) Iterative methods C) Eigenvalue solvers D) Interpolation methods	K2	CO3
4	7	For Newton's backward interpolation, the polynomial is written in terms of: A) $(x-x_0)$ B) $(x-x_n)$ C) $(x-x_{n/2})$ D) $(x-x_1)$	K1	CO4
	8	The value of the Lagrange interpolation polynomial at $x=x_i$is: A) Always 0 B) Always $f(x_i)$ C) Undefined D) Always 1	K2	CO4
5	9	What happens to the error in numerical differentiation as $h$decreases? A) Error always increases B) Error always decreases C) Error decreases initially then may increase due to rounding errors D) Error remains constant	K1	CO5
	10	Trapezoidal rule which is applicable only when n is _____ A) Any value of n B) a multiple of 2 C) a multiple of 3 D) a multiple of	K2	CO5

Cont...

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.	Explain why every square matrix and its transpose have same eigen values.	K2	CO1
		(OR)		
	11.b.	Verify Cayley Hamilton theorem for A=$\begin{pmatrix}2 & 1\\1 & 2\end{pmatrix}$.		
2	12.a.	Form the equations, with rational coefficients one root of whose roots is $\sqrt{2}+\sqrt{3}$.	K3	CO2
		(OR)		
	12.b.	Solve the equations $x^3-12x^2+39x-28=0$ whose roots are in A.P.		
3	13.a.	Solve the following equations by Gauss Elimination method $x+2y+3z=6, 2x+4y+z=7, 3x+2y+9z=14$.	K3	CO3
		(OR)		
	13.b.	Solve the equations by Gauss Seidel $8x-3y+2z=20, 4x+11y-z=33, 6x+3y+12z=35$.		
4	14.a.	Using Newton's formula find the pressure of the steam for a temperature of 142 °C Temperature °C: 140 150 160 170 180 Pressure kg f/cm^2 3.685 4.854 6.302 8.076 10.225	K3	CO4
		(OR)		
	14.b.	Given the data x: 0 1 2 5 $f(x)$: 2 3 12 147 find the cubic function of x.		
5	15.a.	Using Newton's Backward interpolations formula, estimate $f(8)$ from the table. x : 1 2 3 4 5 y : 1 8 27 64 125	K2	CO5
		(OR)		
	15.b.	Using the trapezoidal rule, estimate $\int_{0.6}^{2} y\,dx$ from the given table. x: 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 y: 1.23 1.58 2.03 4.32 6.25 8.36 10.23 12.45		

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 value & Eigen vector of A=$\begin{pmatrix}2 & 0 & 1\\0 & 3 & 0\\1 & 0 & 2\end{pmatrix}$.	K4	CO1
2	17	If α, β, γ are the roots of the equation $x^3+px^2+qx+r=0$, form the equation whose roots are i) $\alpha^2+1, \beta^2+1, \gamma^2+1$ ii) βα, βγ, γα	K4	CO2
3	18	Solve the equations by Gauss Jacobi method $4x+2y+z=14, x+4y-z=10, x+y+8z=20$.	K4	CO3
4	19	Using Newton's forward interpolation formula,calculate f(1.02) upto three decimal place in the table given below x: 1.0 1.1 1.2 1.3 1.4 $f(x)$: 0.841 0.891 0.932 0.964 0.985	K4	CO4
5	20	From following data find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x=1.05 x: 1.00 1.05 1.10 1.15 1.20 1.25 1.30 y:1.00000 1.02470 1.04881 1.07238 1.09544 1.11803 1.14017	K4	CO5

Z-Z-Z END