22BCU208N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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	If the eigen values of $\begin{bmatrix} 2 & 3 \\ x & y \end{bmatrix}$ are 4 and 8, then x & y = ____ a) 4, 10 b) 5, 8 c) -3, 9 d) -4, 10	K1	CO1
	2	If Two eigen values of $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ are 2 and 8, then the eigen values of A^2 is _____ a) 1, 4 b) 2, 8 c) 4, 64 d) 4, 16	K1	CO1
2	3	If the sum of the roots of the equation $\lambda x^2+2x+3\lambda=0$ be equal to their product, then λ = _____ a) 4 b) – 4 c) 2/3 d) – 2/3	K1	CO2
	4	The transformed equation whose roots are negative of the roots of $x^3 - x^2 + x - 4 = 0$ is _____ a) $- x^3 + x^2 - x + 4 = 0$ b) $x^3 - x^2 - x - 4 = 0$ c) $- x^3 - x^2 - x - 4 = 0$ d) $x^3 + x^2 + x + 4 = 0$	K2	CO2
3	5	In Gauss Seidel method, the coefficient matrix is transformed into _____ matrix. a) triangular b) unit c) square d) diagonal	K2	CO3
	6	Which of the following is an assumption of Jacobi's method? a) The rate of convergence is quite slow compared with other methods b) The coefficient matrix has no zeros on its main diagonal c) Iteration involved in Jacobi's method converges d) The coefficient matrix has zeroes on its main diagonal	K1	CO3
4	7	The relationship between E and ∇ is _____ a) $E = 1 - \nabla$ b) $E = 1 + \nabla$ c) $E = \nabla - 1$ d) $E = 1/\nabla$	K2	CO4
	8	The process of finding the values inside the interval (x_0, x_n) is called _____ a) Interpolation b) Extrapolation c) Iterative d) Polynomial equation	K2	CO4
5	9	Let h be the finite difference, then the forward difference operator is defined by _____ a) f(x) = f(x/h) b) f(x) = f(x*h) c) f(x) = f(x-h)-f(x) d) f(x) = f(x+h)-f(x)	K1	CO5
	10	Trapezoidal and Simpson's rule can be used to evaluate _____ a) Multiple integrals b) Differentiation c) Double integrals d) Divided difference	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.	Find the matrix whose eigen values are -1, -2 and the corresponding eigen vectors are $\begin{pmatrix}1\\-1\end{pmatrix}$ and $\begin{pmatrix}1\\-2\end{pmatrix}$ respectively.	K2	CO1
		(OR)		
	11.b.	Find the Eigen values and Eigen Vectors of $\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$		
2	12.a.	If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, calculate the values of (i) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ (ii) $\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}$	K3	CO2
		(OR)		
	12.b.	Form an equation whose roots are square of the roots of the equation $x^3 - 2x^2 + 3x + 1 = 0$		
3	13.a.	Solve the following system of equations by Gauss Seidel method correct to three decimal places 4x+2y+z=14, x+5y-z=10, x+y+8z=20.	K2	CO3
		(OR)		
	13.b.	Solve the given system of equations by Gauss-Elimination method x + y + z = 4, x + 4y + 3z = 8, x + 6y + 2z = 6.		
4	14.a.	A third degree polynomial passes through the points (0, -1), (1, 1), (2, 1) and (3, -2), using Newton's forward interpolation formula find the polynomial f(x) and hence find f(1.5).	K3	CO4
		(OR)		
	14.b.	Using Lagrange's interpolation formula find f (4) given that f(0) = 2, f(1) = 3, f(2) = 12, f(15) = 3587.		
5	15.a.	Evaluate dy/dx and d^2y/dx^2 at x = 51 from the following data.	K2	CO5
		(OR)		
	15.b.	Dividing the range 10 equal parts, estimate the value of $\int_0^{\pi/2} \sin x\, dx$ by (i) Trapezoidal rule (ii) Simpson's rule.		

X	50	60	70	80	90
Y	19.96	36.65	58.81	77.21	94.61

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	Verify Cayley-Hamilton theorem and hence find A^{-1} and A^4 for $A = \begin{pmatrix}-2 & -1 & 2\\ -1 & 2 & -1\\ 1 & -1 & 2\end{pmatrix}$	K4	CO1
2	17	Determine the root of $x^4 + x^3 - 7x^2 - x + 5 = 0$ which lies between 2 and 3 correct to three decimal places.	K3	CO2
3	18	Use Gauss Jacobi method to approximate the solution of the following system of linear equations 5x – 2y + 3z = -1 ; -3x + 9y + z = 2 ; 2x – y – 7z = 3	K3	CO3
4	19	Using Lagrange's interpolation formula find f (x) given that f(1) = 0, f(2) = 7, f(3) = 26, f(5) = 124.	K4	CO4
5	20	Compute f'(0.5) and f''(3.5) from the given data	K4	CO5

X	0	1	2	3	4
Y	1	2.718	7.381	20.086	54.598

Z-Z-Z END