PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(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 0, 3, 4 are the eigen values of a square matrix A of order 3, then det (A) is (a) 12 (b) 0 (c) ∞ (d) $\frac{1}{12}$	K1	CO1
	2	If two eigen values of $\begin{pmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{pmatrix}$ are 1 and -1, then the third eigen value is _____. (a) 4 (b) 2 (c) -1 (d) 1	K2	CO1
2	3	If one root of $5x^2+13x+k=0$ is reciprocal of the other, then k = _____ (a) 5 (b) 13 (c) 1/5 (d) 1/13	K2	CO2
	4	The transformed equation of $x^3 + 3x^2 + x - 4 = 0$ into the equation whose roots are multiplied by 10 is _____ a) $x^3 + 3x^2 + x - 4 = 0$ b) $x^3 + 30x^2 + 10x - 40 = 0$ c) $x^3 + 30x^2 + 100x - 4000 = 0$ d) $x^3 + 3000x^2 + 100x - 40 = 0$	K2	CO2
3	5	In Gauss Elimination method, the coefficient matrix is transformed into ____ matrix (a) upper triangular (b) unit (c) lower triangular (d) diagonal	K1	CO3
	6	The rate of convergence of Gauss Seidal method is roughly ____ that of Gauss Jacobi. (a) twice (b) thrice (c) once (d) 4 times	K1	CO3
4	7	Newton's forward and backward interpolation formula will be used for ____ intervals. (a) unequal (b) equal (c) infinite (d) finite	K1	CO4
	8	The process of finding the value of a function inside the given range is called ____ (a) interpolation (b) integration (c) extrapolation (d) differentiation	K1	CO4
5	9	In Newton's forward difference formula, u = ____ (a) $x - x_n$ (b) $x - x_0$ (c) $(x - x_n) / h$ (d) $(x - x_0) / h$	K1	CO5
	10	The number of intervals in Simpson's 3/8 rule should be a multiple of ____ (a) 4 (b) 5 (c) 3 (d) 2	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.	Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$	K3	CO1
		(OR)		
	11.b.	Find the eigen values and eigen vectors of $\begin{bmatrix} 6 & -6 & 5 \\ 14 & -13 & 10 \\ 7 & -6 & 4 \end{bmatrix}$		
2	12.a.	Show that the equation $x^3 + qx + r = 0$ has two equal roots if $27r^2 + 4q^3 = 0$.	K4	CO2
		(OR)		
	12.b.	Find the equation whose roots are less by 2, than the roots of the equation $x^5 - 3x^4 - 2x^3 + 15x^2 + 20x + 15 = 0$.		
3	13.a.	Solve the following system of equations by Gauss-seidel method $3x - y + z = 1$, $3x + 6y + 2z = 0$ and $3x + 3y + 7z = 4$.	K4	CO3
		(OR)		
	13.b.	Solve the given system of equations by Gauss-Elimination method $10x-2y+3z = 23$, $2x+10y-5z = -33$, $3x-4y+10z = 41$.		
4	14.a.	Use Newton's backward formula to evaluate tan(0.28) given tan(0.10) = 0.1003, tan(0.15) = 0.1511, tan(0.20) = 0.2027, tan(0.25) = 0.2533, tan(0.30) = 0.3093.	K3	CO4
		(OR)		
	14.b.	Solve ln x = 1.3 by inverse Interpolation using x = G(y) with G(1) = 2.718, G(1.5) = 4.481, G(2) = 7.387, G(2.5) = 12.179 and find value of x.		
5	15.a.	Obtain f '(0) and f "(4) from the data x: 0 1 2 3 4 f(x): 1 2.718 7.381 20.086 54.598	K4	CO5
		(OR)		
	15.b.	Using Simpson's one third rule, evaluate the value of $\int_0^1 xe^x dx$ by taking 4 intervals. Compare your result with actual value.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

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

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td>1</td><td>16</td><td>Verify Cayley-Hamilton theorem and hence find A^{-1} and A^4 for $A = \begin{pmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{pmatrix}$.</td><td>K4</td><td>CO1</td></tr>
<tr><td>2</td><td>17</td><td>Calculate a root of $x^4 - x - 10 = 0$, which is near to $x = 2$, correct to three places of decimal.</td><td>K3</td><td>CO2</td></tr>
<tr><td>3</td><td>18</td><td>Use Gauss Jacobi method to approximate the solution of the following system of linear equations $5x - y + z = 10; 2x + 4y = 12; x + y + 5z = -1$.</td><td>K3</td><td>CO3</td></tr>
<tr><td>4</td><td>19</td><td>Using Lagrange's interpolation formula, find a polynomial y(x) and hence find y(4) from the following table.
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>5</td></tr>
<tr><td>y</td><td>0</td><td>7</td><td>26</td><td>124</td></tr>
</table></td><td>K4</td><td>CO4</td></tr>
<tr><td>5</td><td>20</td><td>Obtain $f'(0)$ and $f''(4)$ from the data.
<table>
<tr><td>x:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>f(x):</td><td>1</td><td>2.718</td><td>7.381</td><td>20.086</td><td>54.598</td></tr>
</table></td><td>K4</td><td>CO5</td></tr>
</table>

Z-Z-Z END