

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 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	Sum of eigen values is equal to the sum of the _____ elements. (a) diagonal (b) unit (c) determinant (d) square	K1	CO1
	2	If λ is an eigen value of A, then _____ is an eigen value of A^2 . (a) $(-\lambda)^2$ (b) λ^{-2} (c) λ^2 (d) λ^4	K2	CO2
2	3	A symmetric function of the roots of an equation is a function involving all the roots of an equation such that the _____ remains unaltered. (a) coefficients (b) expression (c) value (d) constant	K1	CO1
	4	If α, β, γ are the roots of the equation $x^3 + qx + r = 0$ then the value of $\alpha + \beta + \gamma =$ _____. (a) q (b) r (c) 1 (d) 0	K2	CO2
3	5	In an indirect or iterative method, the amount of computation depends on the _____ required. (a) degree of accuracy (b) convergency (c) diagonal (d) approximation	K1	CO1
	6	_____ is a self-correcting method. (a) error (b) iteration (c) operations table (d) relaxation	K2	CO2
4	7	_____ denotes the process of computing the values of a function for any value of the independent variable within an interval for which some values are given. (a) extrapolation (b) independent variable (c) operation (d) interpolation	K1	CO1
	8	The n^{th} divided differences of a polynomial of the n^{th} degree are _____. (a) constant (b) variable (c) arguments (d) symmetrical	K2	CO2
5	9	If the values of x are not equally spaced, the _____ formula is used to represent the function. (a) newton's divided difference (b) numerical differentiation (c) numerical integration (d) central difference	K1	CO1
	10	Simpson's one third rule is also known as _____. (a) hyperbolic rule (b) parabolic rule (c) elliptic rule (d) tangent rule	K2	CO2

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 eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.	K2	CO2													
	(OR)																
	11.b.	Verify Cayley-Hamilton theorem for $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$.															
2	12.a.	Solve the equation $x^4 + 4x^3 + 6x^2 + 4x + 5 = 0$ given that $\sqrt{-1}$ is a root.	K3	CO3													
	(OR)																
	12.b.	Find the condition that the roots of $x^3 + 3px^2 + 3qx + r = 0$ may be in Harmonic Progression.															
3	13.a.	Solve by Gauss-Elimination method the equations $2x + y + 4z = 12$ $8x - 3y + 2z = 20$ $4x + 11y - z = 33$.	K2	CO2													
	(OR)																
	13.b.	Solve the equations $27x + 6y - z = 85$ $6x + 15y + 2z = 72$ $x + y + 54z = 110$ by Gauss-Seidel method of iteration.															
4	14.a.	Given the values <table><tr><td>x:</td><td>14</td><td>17</td><td>31</td><td>35</td></tr><tr><td>f(x):</td><td>68.7</td><td>64.0</td><td>44.0</td><td>39.1</td></tr></table> find the values of f(x) corresponding to x = 27 using lagrange's formula.	x:	14	17	31	35	f(x):	68.7	64.0	44.0	39.1	K3	CO3			
	x:	14	17	31	35												
	f(x):	68.7	64.0	44.0	39.1												
(OR)																	
14.b.	The following are data from the steam table: <table><tr><td>Temperature °c:</td><td>140</td><td>150</td><td>160</td><td>170</td><td>180</td></tr><tr><td>Pressure kg f/cm²:</td><td>3.685</td><td>4.854</td><td>6.302</td><td>8.076</td><td>10.225</td></tr></table> Using Newton's formula, find the pressure of the steam for a temperature of 142°.	Temperature °c:	140	150	160	170	180	Pressure kg f/cm ² :	3.685	4.854	6.302	8.076	10.225				
Temperature °c:	140	150	160	170	180												
Pressure kg f/cm ² :	3.685	4.854	6.302	8.076	10.225												
5	15.a.	From the following table, find the value of x for which y is minimum and find this value of y. <table><tr><td>x:</td><td>0.60</td><td>0.65</td><td>0.70</td><td>0.75</td></tr><tr><td>y:</td><td>0.6221</td><td>0.6155</td><td>0.6138</td><td>0.6170</td></tr></table>	x:	0.60	0.65	0.70	0.75	y:	0.6221	0.6155	0.6138	0.6170	K2	CO2			
	x:	0.60	0.65	0.70	0.75												
	y:	0.6221	0.6155	0.6138	0.6170												
(OR)																	
15.b.	Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.25 from the table of values given below using newton's backward difference formula. <table><tr><td>x:</td><td>1.00</td><td>1.05</td><td>1.10</td><td>1.15</td><td>1.20</td><td>1.25</td><td>1.30</td></tr><tr><td>y:</td><td>1.0000</td><td>1.0247</td><td>1.04881</td><td>1.07238</td><td>1.09544</td><td>1.11803</td><td>1.14017</td></tr></table>	x:	1.00	1.05	1.10	1.15	1.20	1.25	1.30	y:	1.0000	1.0247	1.04881	1.07238	1.09544	1.11803	1.14017
x:	1.00	1.05	1.10	1.15	1.20	1.25	1.30										
y:	1.0000	1.0247	1.04881	1.07238	1.09544	1.11803	1.14017										

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 $\begin{pmatrix} 4 & -20 & -10 \\ -2 & 10 & 4 \\ 6 & -30 & -13 \end{pmatrix}$.	K3	CO4														
2	17	If α, β, γ are the roots of $x^3 - px^2 + qx - r = 0$ find the values of (i) $\sum \frac{\beta^2 + \gamma^2}{\beta\gamma}$ (ii) $\sum (\beta - \gamma)^2$ (iii) $\sum (\beta^2 + \beta\gamma + \gamma^2)$.	K3	CO5														
3	18	Using Gauss-Jacobi iteration method, solve correct to three decimal places, the system of equations $\begin{aligned} x + 17y - 2z &= 48 \\ 30x - 2y + 3z &= 75 \\ 2x + 2y + 18z &= 30. \end{aligned}$	K3	CO4														
4	19	By means of Newton's divided difference formula, find the value of $f(8)$ given <table border="1"><tr><td>$x:$</td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr><tr><td>$f(x):$</td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr></table>	$x:$	4	5	7	10	11	13	$f(x):$	48	100	294	900	1210	2028	K3	CO5
$x:$	4	5	7	10	11	13												
$f(x):$	48	100	294	900	1210	2028												
5	20	Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi \sin x \, dx$ by (a) Trapezoidal rule (b) Simpson's rule.	K3	CO5														

Z-Z-Z END