

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022  
(Second Semester)

Branch – BIO CHEMISTRY

MATHEMATICS

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 X 1 = 5)

- If  $\cos \theta + i \sin \theta = x$ , then  $x^n + \frac{1}{x^n} =$  \_\_\_\_\_  
(i)  $2 \cos n\theta$                       (ii)  $2i \cos n\theta$                       (iii)  $2i \sin n\theta$                       (iv)  $2 \sin n\theta$
- Find the sum of the Eigenvalues of the matrix  $\begin{pmatrix} 3 & 6 & 7 \\ 5 & 4 & 2 \\ 7 & 9 & 1 \end{pmatrix}$   
(i) 7                      (ii) 9                      (iii) 8                      (iv) 1
- In Gauss elimination method, the solutions can be obtained by \_\_\_\_\_ method.  
(i) indirect    (ii) back substitution  
(iii) iterative    (iv) none of the above
- Newton's forward interpolation formula is applicable for interpolation near the \_\_\_\_\_ of tabulated values  
(i) end    (ii) middle  
(iii) anywhere    (iv) beginning
- The number of intervals in Simpson's 3/8 rule should be a multiple of \_\_\_\_\_  
(i) 4                      (ii) 5                      (iii) 3                      (iv) 2

SECTION - B (15 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 X 3 = 15)

- a) Express  $\cos 5\theta$  in terms of  $\sin \theta$ .  
(OR)  
b) Precise  $\sin^5 \theta$  in series of cosines of multiples of  $\theta$ .
- a) Find all values of parameters  $p$  and  $q$  for which the matrix  $A = \begin{pmatrix} 2 & p \\ 2 & q \end{pmatrix}$  has eigenvalues equal to -1 and -3.  
(OR)  
b) Show that the matrix  $A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$  satisfies its own characteristic equation.
- a) Solve the system of equations by Gauss-Elimination method  
 $x + y + z = 3$ ,  $x + 2y + 3z = 0$ ,  $x + 3y + 2z = 3$   
(OR)  
b) Solve the following system of equations by Gauss Seidel method correct to three decimal places  $45x + 2y + 3z = 58$ ,  $-3x + 22y + 2z = 47$ ,  $5x + y + 20z = 67$ .
- a) Given the following data points. Estimate the value of  $x$  when  $y = 0.5$

x	0.0	0.5	1	2
Y	0.0	0.57	1.46	5.05

(OR)

Cont...

- b) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface. Find the value of  $y$  when  $x = 410$ .

X = height	100	150	200	250	300	350	400
Y = distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

- 15 a) Find  $dy/dx$  and  $d^2y/dx^2$  at  $x = 0$  from the following data

X	0	1	2	3
Y	5	6	3	8

(OR)

- b) Using Simpson's one third rule, find the solution of

X	0	0.1	0.2	0.3	0.4
Y	1	0.9975	0.99	0.9776	0.8604

**SECTION - C (30 Marks)**

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 6 = 30)

- 16 a) Evaluate  $\int \sin^5 x \cos^2 x dx$ .

(OR)

- b) Express  $\cos 8\theta$  in terms of  $\sin \theta$ .

- 17 a) Using Cayley-Hamilton theorem find  $A^{-1}$  and  $A^4$  for  $A = \begin{pmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$

(OR)

- b) Find the Eigen values and Eigen Vectors of  $\begin{pmatrix} 2 & 0 & 0 \\ 0 & 3 & 4 \\ 0 & 4 & 9 \end{pmatrix}$

- 18 a) Solve the following system of equations by Gauss Jacobi method  
 $26x + 2y + 2z = 12.6$ ,  $3x + 27y + z = -14.3$ ,  $2x + 3y + 17z = 6.0$ .

(OR)

- b) Solve the following system of equations by Gauss-Seidel method  
 $12x + 3y - 5z = 1$ ,  $x + 5y + 3z = 28$  and  $3x + 7y + 13z = 76$ .

- 19 a) Find the cubic polynomial which takes the following values:

x	0	1	2	3
f(x)	1	2	1	10

Hence or otherwise evaluate  $f(4)$ .

(OR)

- b) Find Lagrange's interpolation polynomial fitting the points  
 $f(1) = -3$ ,  $f(3) = 0$ ,  $f(4) = 30$ ,  $f(6) = 132$ . Hence find  $f(5)$ .

- 20 a) Compute  $f'(1.1)$  and  $f''(1.5)$  from the given data

X	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

(OR)

- b) Dividing the range 10 equal parts, find the value of  $\int_0^{\pi} \sin x dx$  by

(i) Trapezoidal rule (ii) Simpson's rule.