PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(First Semester)

Common to Branches – **COMPUTER SCIENCE & COMPUTER TECHNOLOGY**

MATHEMATICS - I

Time: Three Hours   Maximum: 50 Marks

SECTION-A (5 Marks)
Answer ALL questions
ALL questions carry EQUAL marks   (5 x 1 = 5)

1.   Identify the rank of $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$
     i) 0   ii) 1
     iii) 2   iv) 3

2.   Choose the complementary function of $(D^2 + 6D + 9)y = e^{-2x}$
     i) $(Ax + B)e^{-3x}$ ii) $Ae^{-3x} + Be^{-2x}$
     iii) $Ae^{-6x} + Be^{-2x}$ iv) $(Ax + Bx)e^{3x}$

3.   The system of n equations in n unknowns are reduced to an equivalent upper triangular systemand solved by back substitution method is
     i)Gauss Jacobi   ii) Gauss Seidel
     iii) Gauss elimination   iv) Gauss Jordan

4.   The process of finding intermediate values is called
     i)Extrapolation   ii)) Interpolation
     iii) Iterative   iv) Polynomial Equation

5.   In Simpson's one-third rule, the number of intervals must be ----------
     i) Even   ii) Odd
     iii) Three   iv) Anything

SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6.   a) Find the rank of $D = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 2 & 13 & 10 \end{bmatrix}$.
        (OR)
     b) Compute the Eigen Values of $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$.

7.   a) Solve $(D^2 + 4)y = x4$.
        (OR)
     b) Solve $pq + p + q = 0$.

8.   a) Solve the following system of equations by Gauss-elimination method
$$2x + y + 4z = 12$$
$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
        (OR)
     b) Solve the following system of equations by Gauss-Seidel method up to 2nd iteration
$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

9. a) Write Newton's forward and backward interpolation formula

(OR)

b) Form Newton's forward difference table for the following data

x	1891	1901	1911	1921	1931
y	46	66	81	93	101

10. a) Give Newton's backward derivative for first order.

(OR)

b) Provide formula for trapezoidal rule, Simpson's 1/3 rule.

SECTION – C (30 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 6 = 30)

11. a) Show that the following equations
$$2x - y + z = 7$$
$$3x + y - 5z = 13$$
$$x + y + z = 5$$
are consistent and solve them.

(OR)

b) Compute the Eigen vectors of $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

12. a) Solve $(D^2 + 5D + 4)y = e^{-x}sin2x$.

(OR)

b) Solve the equation $z = px + qy + p^2 + pq + q^2$.

13. a) Solve the following system of equations by Gauss Jacobi iterative method.

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

(OR)

b) Solve the following system of equations by Gauss Jordan method
$$2x - 3y + z = -1$$
$$x + 4y + 5z = 25$$
$$3x - 4y + z = 2$$

14. a) Find the values of y at $x = 21$ from the following data

x	20	23	26	29
y	0.3420	0.3907	0.4384	0.4848

(OR)

b) Construct Newton's forward interpolation polynomial for the following data

x	4	6	8	10
y	1	3	8	16

15. a) Find the first derivative of $x^{\frac{1}{3}}$ at $x = 50$ and $x = 56$ given the table below

x	50	51	52	53	54	55	56
$y = x^{\frac{1}{3}}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(OR)

b) Evaluate $I = \int_0^6 \frac{1}{1+x} dx$ by Trapezoidal rule and Simpson's 1/3 rule. Taken h=1.

Z-Z-Z   END