PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc & BCA DEGREE EXAMINATION MAY 2025
(Second Semester)

Common to Branches – **INFORMATION TECHNOLOGY & COMPUTER APPLICATIONS**

MATHEMATICAL FOUNDATIONS OF COMPUTING

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 a non – zero matrix A of order 2 × 2 with det (A) = 0 then the rank of the matrix is _____ a) 0 b) 1 c) 2 d) 4	K1	CO1
	2	Find the sum of the Eigen values of a matrix $A = \begin{bmatrix} 2 & 5 & -1 \\ 0 & 2 & 5 \\ 0 & 0 & 5 \end{bmatrix}$ a) 9 b) 2 c) 20 d) 5	K2	CO1
\2	3	The solution of the differential equation $(D^2 - 5D + 4)y = 0$ is $y =$ _____ a) $c_1e^{-x} + c_2e^{4x}$ b) $c_1e^{x} + c_2e^{-4x}$ c) $c_1e^{x} + c_2e^{4x}$ d) $c_1e^{-x} + c_2e^{-4x}$	K1	CO2
	4	The P.I of the differential equation $(D^2 + 5D + 6)y = e^x$ is _____ a) $\frac{e^x}{12}$ b) e^x c) $\frac{12}{e^x}$ d) 12	K2	CO2
3	5	After eliminating the arbitrary function from $z = f(x^2 + y^2)$ we obtain -------- a) $py = qx$ b) $px^2 = qy^2$ c) $px = qy$ d) $p/x^2 = q/y^2$	K1	CO3
	6	Identify the Clairaut's form a) $y = f(x) + g(p)$ b) $y = f(y) + g(p)$ c) $x = f(y) + g(p)$ d) $y = px + f(p)$	K2	CO3
4	7	The primary goal of the Gauss-Jordan method in solving a system of linear equation is ----. a) To find the determinant of the coefficient matrix b) To reduce the coefficient matrix to its row echelon form c) To reduce the coefficient matrix to its reduced row echelon form (RREF) d) To find the eigenvalues of the coefficient matrix	K1	CO4
	8	In the context of the Gauss-Seidel method, what is meant by the term "diagonally dominant"? a) Every element in the diagonal is larger than the sum of the off-diagonal elements in the row b) Every element in the diagonal is smaller than the sum of the off-diagonal elements in the row c) Every diagonal element is equal to the sum of the off-diagonal elements in the row d) Every element in the diagonal is larger than the corresponding element in the column	K2	CO4
5	9	What is the order of accuracy of the central difference formula? a) o(h) b) $o(h^2)$ c) $o(h^3)$ d) $o(h^4)$	K1	CO5
	10	What is the minimum number of subintervals required for Simpson's $3/8^{th}$ rule? a) 2 b) 4 c) 3 d) 5	K2	CO5

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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.	Solve the following system of equations $10x+y+z=12; 2x+10y+z=13; x+y+5z=7$	K2	CO1
		(OR)		
	11.b.	Find the Eigen values and Eigen vectors of the matrix $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$.		
2	12.a.	Solve the differential equation. $(D-2)^2 = 8(e^{2x}+sin2x+x^2)$	K3	CO2
		(OR)		
	12.b.	Find the Particular Integral of $(D+2)(D-1)^2y = e^{-2x}+2\,sinhx.$		
3	13.a.	Solve the PDE $px(y^2+z)-qy(x^2+z)=z(x^2-y^2)$	K3	CO3
		(OR)		
	13.b.	Solve the PDE $yp^2+(x-y)p-x=0.$		
4	14.a.	Solve the following system of equations by using Gauss – Elimination method. $2x+3y-z=5; 4x+4y-3z=3;\ 2x-3y+2z=2.$	K4	CO4
		(OR)		
	14.b.	Solve the following system of equations by using Gauss Jordan method $2x+4y+8z=41; 4x+6y+10z=56; 6x+8y+10z=64$.		
5	15.a.	Given that 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 Find the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1	K4	CO5
		(OR)		
	15.b.	Evaluate $\int_0^6 \frac{1}{1+x^2}dx$ using (i) Trapezoidal rule (ii) Simpson's 1/3rd rule and verify the results by actual integration.		

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 the matrix $\begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$.	K4	CO1
2	17	Find the complete solution of the differential equation $(D^3-2D+4)y = e^x cosx.$	K4	CO2
3	18	Solve the differential equation $x^2(y-z)p+y^2(z-x)q=z^2(x-y).$	K4	CO3
4	19	Solve the system of equations $2x-3y+20z=25; 20x+y-2z=17; 2x-3y+20z=25$	K4	CO4
5	20	From the following table find $f'(30)$, $f'(31)$ and $f'(35)$. x: 30, 31, 32, 33, 34, 35, 36 f(x): 85.90, 86.85, 87.73, 88.63, 89.52, 90.37, 91.1	K4	CO5

Z-Z-Z END