PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc / BCA DEGREE EXAMINATION MAY 2024
(Second Semester)

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

MATHEMATICAL FOUNDATIONS OF COMPUTING

Time: Three Hours   Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks $(10 \times 1 = 10)$

Module No.	Question No.	Question	K Level	CO
1	1	The rank of two matrices are same only if they are _____ matrices. a) row b) square c) equivalent d) non zero	K1	CO1
	2	Which matrix satisfies its own characteristic equation? a) row b) square c) column d) singular	K2	CO1
2	3	Which of the following are the roots of $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 4y = 0$? a)1 and 4 b) -1 and -4 c)-1 and 4 d) 1 and -4	K2	CO2
	4	Identify the roots of the equation whose solution is $y = Ae^{m_1 x} + Be^{m_2 x}$ a) real and distinct b) real and equal c) imaginary d) constant	K1	CO2
3	5	What is the PDE of $z = (x + a)(y + b)$ by eliminating a and b? a) $z = (x + p)(y + q)$ b) $z = (x - p)(y - q)$ c) $z = (x + q)(y + p)$ d) $z = pq$	K2	CO3
	6	Identify the Lagrange's linear equation. a) $P + Q = R$ b) $P - Q = R$ c) $Pp - Qq = R$ d) $Pp + Qq = R$	K1	CO3
4	7	In Gauss-Jordan elimination method, the given matrix is reduced to _____ matrix. a) upper triangular b) lower triangular c) diagonal d) identity	K2	CO4
	8	Interpret the convergence, when the coefficient matrix A is diagonally dominant in $AX = B$? a) converges slowly b) converges quickly c) does not converge d) converges always	K1	CO4
5	9	The process of computing _____ is called numerical differentiation. a) derivative b) derivative of a constant c) derivative for some particular value d) integral	K1	CO5
	10	Compute the order of error in Trapezoidal rule. a) h^2 b) h^3 c) h^{-1} d) h^{-2}	K2	CO5

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.	Identify the rank of $\begin{bmatrix} -2 & -1 & -1 \\ 12 & 8 & 6 \\ 10 & 5 & 6 \end{bmatrix}$.	K2	CO1
		(OR)		
	11.b.	Calculate A^4, when $A = \begin{bmatrix} -1 & 3 \\ -1 & 4 \end{bmatrix}$.		
2	12.a.	Solve $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} + 2y = 0$.	K3	CO2
		(OR)		
	12.b.	Solve $(D^2 + 5D + 6)y = e^x$.		
3	13.a.	Solve $\frac{\partial^2 z}{\partial x \partial y} = 0$.	K3	CO3
		(OR)		
	13.b.	Solve $p^2 + q^2 = npq$.		
4	14.a.	Apply Gaussian elimination method to solve the following system of equations. $x + y + z = 9$ $2x - 3y + 4z = 13$ $3x + 4y + 5z = 40$	K3	CO4
		(OR)		
	14.b.	Apply Gauss Jordan method to solve the following system of equations. $x + y = 2$ $2x + 3y = 5$		
5	15.a.	Evaluate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 51$ from the following data x 50 60 70 80 90 y 19.96 36.65 58.81 77.21 94.61	K4	CO5
		(OR)		
	15.b.	Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Trapezoidal rule using 11 coordinates.		

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	Diagonalize the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.	K4	CO1
2	17	Solve $(D^2 - 3D + 2)y = sin3x$.	K3	CO2
3	18	Solve $x^2 \frac{\partial z}{\partial x} + y^2 \frac{\partial z}{\partial y} = (x + y)z$.	K3	CO3
4	19	Apply Gauss Seidel iteration method to solve the following system of equations. $6x + 15y + 2z = 72$ $x + y + 54z = 110$ $27x + 6y - z = 85$	K3	CO4
5	20	The population of a certain town is given below. Year 1931 1941 1951 1961 1971 Population 40.62 60.80 79.95 103.56 132.65 Evaluate the rate of growth of the population in 1961.	K4	CO5

Z-Z-Z   END