25DAU103 / 22DAU103N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch - **COMPUTER SCIENCE WITH DATA ANALYTICS**

MATHEMATICAL FOUNDATION FOR DATA SCIENCE

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	A function f is _____ if $\lim_{x \to a^-} f(x) = f(a)$ a) continuous from the left at a b) continuous at a. c) continuous d) continuous from the right at a.	K1	CO1
	2	If f(x)=$e^x - x$, then f ''(x)is _____. a) $e^x - x$ b) $e^x - 1$ c) e d) e^x	K2	CO1
2	3	The value of $\int_0^1 (4 + 3x^2)dx$ is a) 4 b) -1 c) 5 d) 1	K1	CO2
	4	$\int_1^2 \frac{1}{x^p} dx$ is convergent if a) $p \leq 1$ b) $p > 1$ c) $x \leq 1$ d)$x > 1$	K2	CO2
3	5	Which iterative method updates values as soon as they are computed? a) Jacobi Method b) Gauss-Seidel Method c) Gauss-Jordan Method d) Gauss Elimination	K1	CO3
	6	Gauss Elimination is used to a) Convert the matrix into diagonal form b) Reduce the system to upper triangular form and use back substitution c) Convert the matrix into identity matrix d) Solve only nonlinear equations	K2	CO3
4	7	The forward difference operator is denoted by a) Δ b) ∇ c) δ d) D	K1	CO4
	8	Gregory-Newton forward interpolation formula is used when a) Data points are unevenly spaced b) Interpolation is performed near the beginning of the table c) Interpolation is performed near the end of the table d) Function values are unknown	K2	CO4
5	9	Newton's backward differentiation formula is preferred when a) Interpolating at the middle of the table b) Interpolating near the last data point c) All differences are zero d) Data is not equidistant.	K1	CO5
	10	The Trapezoidal rule integrates by approximating the function with a) A parabola b) A straight line c) Higher-order polynomials d) A cubic spline	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.	Differentiate the function, $f(t)=\sqrt{t}(a+bt)$.	K2	CO1
		(OR)		
	11.b.	Differentiate, $y=(2x+1)^5(x^3-x+1)^4$.		
2	12.a.	Find $\int \sqrt{1+x^2}\,x^5\,dx$.	K2	CO2
		(OR)		
	12.b.	Evaluate : $\int_0^3 \frac{dx}{x-1}$, if possible.		
3	13.a.	Solve by Gauss-Jordan method : 2x+ y + 4z=12 8x-3y + 2z=20 4x+11y- z=33.	K3	CO3
		(OR)		
	13.b.	Solve by Gauss-Elimination method to the following equations 3x - y+2z=12 x+2y+3z=11 2x- 2y - z=2.		
4	14.a.	Using Newton's Formula, find y when x=27, from the following data x : 10 15 20 25 30 y : 35·4 32·2 29·1 26·0 23·1	K3	CO4
		(OR)		
	14.b.	Construct Newton's forward interpolation polynomial for the following data: x : 4 6 8 10 y : 1 3 8 16		
5	15.a.	Find $\frac{dy}{dx}$ at x=1·25 from the table x : 1·00 1·05 1·10 1·15 y : 1·00000 1·02470 1·04881 1·07238 1·20 1·25 1·30 1·09544 1·11803 1·14017	K3	CO5
		(OR)		
	15.b.	Using the trapezoidal rule, evaluate $\int_{0.6}^{2} y\,dx$ from the following table x : 0·6 0·8 1·0 1·2 y : 1·23 1·58 2·03 4·32 1·4 1·6 1·8 2·0 6·25 8·36 10·23 12·45		

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 absolute maximum and minimum values of the function, $f(x) = x^3 - 3x^2 + 1$, $-\frac{1}{2} \le x \le 4$	K3	CO1
2	17	Find $\int \frac{dx}{x^2 - a^2}$, where $a \neq 0$.	K2	CO2
3	18	Solve the following equation by Gauss- Seidel iteration method, 28x+4y-z=32 x+3y+10z=24 2x+17y+4z=35	K2	CO3
4	19	In the table below, Estimate the missing value : x : 0 1 2 3 4 y : 1 2 4 - 16 Also explain why it differs from $2^3 = 8$.	K3	CO4
5	20	Dividing the range into 10 equal parts, find the approximate value of $\int_0^{\pi} \sin x \, dx$ by Simpson's rule.	K3	CO5

Z-Z-Z END