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22NDU312N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Third Semester)

Branch - **NUTRITION, FOOD SERVICE MANAGEMENT AND DIETETICS**

MATHEMATICS

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	The product of the eigenvalues of a matrix is equal to its a) Determinant b) Trace c) Order d) Transpose	K1	CO1
	2	According to the Cayley-Hamilton theorem, every square matrix satisfies its own a) Characteristic vector b) Characteristic equation c) Adjoint d) Inverse	K2	CO1
2	3	For the cubic equation $x^3 + ax^2 + bx + c = 0$, the sum of the products of the roots taken two at a time is a) c/a b) -c/a c) b d) -b	K2	CO2
	4	If one root of the equation $x^2 - 5x + k = 0$ is 2, then the value of k is a) 6 b) -6 c) 10 d) -10	K2	CO2
3	5	The Gauss-Seidel method is an example of a(n) ____ method a) Direct b) Iterative c) Interpolation d) Differentiation	K1	CO3
	6	A major advantage of iterative methods over direct methods like Gauss elimination is: a) They always give exact solutions b) They are simpler to compute by hand c) They are more efficient for large, sparse systems d) They don't require an initial guess	K2	CO3
4	7	Lagrange's interpolation formula is specifically designed for: a) Equal intervals only b) Unequal intervals only c) Both equal and unequal intervals d) Trigonometric functions only	K1	CO4
	8	The first divided difference is analogous to the _____ of a secant line. a) Y-intercept b) X-intercept c) Slope d) Length	K2	CO4
5	9	The Trapezoidal rule for numerical integration gives exact results for polynomials of degree up to: a) 0 b) 1 c) 2 d) 3	K1	CO5
	10	Newton's forward difference formula for derivatives is most accurate when the value to be found is near the _____ of the table. a) End b) Beginning c) Middle d) Cannot say	K2	CO5

Cont ...

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.	Apply Cayley-Hamilton Theorem to find A^{-1} $A = \begin{pmatrix} 5 & 3 \\ 2 & 1 \end{pmatrix}$	K3	CO1
		(OR)		
	11.b.	Apply properties of eigen values to find the eigen values of A^{-1} if $A = \begin{pmatrix} 11 & 2 \\ -1 & 8 \end{pmatrix}$		
2	12.a.	If α, β, γ are the roots of the equation $x^3 - 3ax + b$ prove that $\sum (\alpha - \beta)(\alpha - \gamma) = 9a$	K3	CO2
		(OR)		
	12.b.	Transform the equation $x^3 + 6x^2 + 11x - 6 = 0$ another equation whose roots are 2 more than those of the given equation.		
3	13.a.	Apply the iterative method to solve the system of equations: $x + 2y = 3$, $3x + y = 5$ perform two iterations with initial guess as (0,0)	K3	CO3
		(OR)		
	13.b.	Apply Gauss Seidel method to solve the following system of equations $3x + y = 11$, $2x + 5y = 16$		
4	14.a.	Find the value of y when x = 5 x: 1, 2, 4 y: 7, 3, 1	K4	CO4
		(OR)		
	14.b.	Using Newtons backward interpolation estimate $f(6)$ x: 3, 5, 7, 9 $f(x)$: 13, 6, 4, 2		
5	15.a.	Compute $\frac{d^2y}{dx^2}\Big\|_{x=1}$ x: 0, 1, 2, 3 $f(x)$: 1, 2, 4, 8	K4	CO5
		(OR)		
	15.b.	Compute $\int_0^3 f(x)\,dx$ using Simpson's 1/3 x: 0, 1, 2, 3 $f(x)$: 1, 2, 5, 10		

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 $A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$	K4	CO1
2	17	Solve the equation $x^4 + 16x^3 + 83x^2 + 152x + 84 = 0$ by removing its second term.	K4	CO2
3	18	Solve the following system using Gauss elimination method $3x + 4y + 5z = 18$ $2x - y + 8z = 13$ $5x - 2y + 7z = 20$	K4	CO3
4	19	Derive a 3rd degree polynomial that passes through the points (0,1) (1,2) (2,1) & (3,10)	K5	CO4
5	20	Evaluate the integral $\int_0^1 x^2\,dx$ using Trapezoidal rule correct to four decimal places	K5	CO5

Z-Z-Z END