

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch - ELECTRONICS

MATHEMATICS – I FOR ELECTRONICS

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	Which of the following is always true for a Hermitian matrix A ? a) All eigenvalues are complex b) All eigenvalues are real c) All entries are purely imaginary d) determinant is always zero	K1	CO1
	2	Every square matrix satisfies its _____ equation. a) characteristic b) consistency c) augmented d) none of the above	K2	CO1
2	3	The value of $(\cos\theta + i\sin\theta)^4$ is a) $\cos 4\theta + i\sin 4\theta$ b) $4\cos\theta + i4\sin\theta$ c) $\cos^4\theta + i\sin^4\theta$ d) $\cos 2\theta + i\sin 2\theta$	K1	CO2
	4	Which of the following is the correct expansion for $\cos(2x)$? a) $2\cos^2x - 1$ b) $1 - 2\sin^2x$ c) $1 + 2\sin^2x$ d) $2\sin^2x - 1$	K2	CO2
3	5	What is the main purpose of a reduction formula in integration? a) To simplify differentiation problems b) To reduce a complex integral into a simpler or lower-order form c) To evaluate definite integrals using limits d) To convert an integral into a differential equations	K1	CO3
	6	What is the reduction formula for the integral $\int x^n dx$, when n is a positive integer? a) $\int x^n dx = \frac{x^{n+1}}{n+1} + c$ b) $\int x^n dx = nx^{n-1} + c$ c) $\int x^n dx = x^n + c$ d) $\int x^n dx = \frac{x^n}{n} + c$	K2	CO3
4	7	Find $\int_0^{\pi/2} \int_0^{\pi} \cos(x+y) dx dy$ a) -2 b) 2 c) 1 d) -1	K1	CO4
	8	The value of $\iiint_0^1 x dx dy dz$ where x, y, z varies from 0 to 1 is a) 1/3 b) 1/5 c) 1/4 d) 1/2	K2	CO4
5	9	Find the value of x, y, z using gauss elimination method $2x + y - 3z = -10$; $-2y + z = -2$; $z = 6$ a) 2,4,6 b) 2,7,6 c) 3,4,6 d) 2,4,5	K1	CO5
	10	In Gaussian elimination method, original equations are transformed by using _____ a) Column operations b) Row Operations c) Mathematical Operations d) Subset Operation	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.	Find the characteristic equation of $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$	K3	CO1
		(OR)		
	11.b.	Verify the Cayley-Hamilton theorem for $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$.		
2	12.a.	Show that $\frac{\sin 6\theta}{\sin \theta} = 32\cos^5\theta - 32\cos^3\theta + 6\cos\theta$.	K2	CO2
		(OR)		
	12.b.	Express $\sin 7\theta$ in terms of $\sin \theta$.		
3	13.a.	Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^n x}{\sin^n x + \cos^n x} dx$.	K3	CO3
		(OR)		
	13.b.	Evaluate $\int_0^{\frac{\pi}{2}} \log(\sin x) dx$.		
4	14.a.	Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} dy dx$.	K4	CO4
		(OR)		
	14.b.	Evaluate $\int_0^a \int_0^b \int_0^c (x+y+z) dz dy dx$.		
5	15.a.	Solve the following system of equations using Gauss – Elimination Method $3x + 4y + 5z = 18$; $2x - y + 8z = 13$; $5x - 2y + 7z = 20$.	K5	CO5
		(OR)		
	15.b.	Solve by Gauss Jacobi method up to three decimal places. $10x - 5y - 2z = 3$; $4x - 10y + 3z = -3$; $x + 6y + 10z = -3$.		

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 eigenvalues and eigenvectors of $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.	K5	CO1
2	17	Show that $\sin^6\theta = \frac{-1}{32}(\cos 6\theta - 6\cos 4\theta + 15\cos 2\theta - 10)$.	K4	CO2
3	18	Derive the reduction formula for $\int \sin^n x dx$ and evaluate $\int \sin^7 x dx$.	K5	CO3
4	19	Changing the order of integration and evaluate $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} dy dx$.	K4	CO4
5	20	Solve by Gauss Seidel method up to 3 decimal places $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.	K4	CO5

Z-Z-Z

END