

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	A square matrix A is said to be Hermitian if: a) $A = A^T$ b) $A = -\bar{A}^T$ c) $A = \bar{A}^T$ d) $A = -A$	K1	CO1
	2	If the Eigen values of $A = \begin{pmatrix} 0 & 1 & 1 \\ -4 & 4 & 2 \\ 4 & -3 & -1 \end{pmatrix}$ are 0,1,2 then the Eigen values of A^3 are a) 0,1,2 b) 0, -1, -2 c) 0,1,8 d) $0, \frac{1}{3}, \frac{2}{3}$	K2	CO1
2	3	$(\cos\theta + i \sin\theta)^n =$ a) $\cos(n\theta) + i \sin(n\theta)$ b) $\cos(\theta^n) + i \sin(\theta^n)$ c) $\cos(n\theta) + \sin(n\theta)$ d) $n \cos\theta + i n \sin\theta$	K1	CO2
	4	$16 \sin^4\theta =$ a) $3 + 4\cos 2\theta + \cos 4\theta$ b) $3 + 4\cos 2\theta - \cos 4\theta$ c) $3 - 4\cos 2\theta - \cos 4\theta$ d) $3 - 4\cos 2\theta + \cos 4\theta$	K2	CO2
3	5	The general term in the binomial expansion of $(1 + x)^n$ is a) $nC_r x^r$ b) $nC_r x^n$ c) $nC_r x^{n-r}$ d) $nC_r x^{r-1}$	K1	CO3
	6	The coefficient of x^2 in the expansion of $(1 - 3x)^{1/2}$ is a) $-\frac{3}{8}$ b) $-\frac{9}{8}$ c) $\frac{3}{8}$ d) $\frac{9}{8}$	K2	CO3
4	7	What is the nth derivative of $\frac{1}{x-1}$? a) $(-1)^n n! (x-1)^{-n}$ b) $(-1)^n n! (x-1)^{-(n+1)}$ c) $n! (x-1)^{-(n+1)}$ d) $(-1)^n (n-1)! (x-1)^{-n}$	K1	CO4
	8	If $f(x) = \frac{2x+3}{(x-1)(x+2)}$, what is the correct form for partial fractions? a) $\frac{1}{x-1} + \frac{1}{x+2}$ b) $\frac{5/3}{x-1} + \frac{1/3}{x+2}$ c) $\frac{5/3}{x-1} - \frac{1/3}{x+2}$ d) $\frac{1}{x-1} - \frac{1}{x+2}$	K2	CO4
5	9	What is the reduction formula for $\int \sin^n x dx$? a) $I_n = -\frac{1}{n} \sin^{n-1} x \cos x + \frac{n-1}{n} I_{n-2}$ b) $I_n = \frac{1}{n} \sin^{n-1} x \cos x + \frac{n-1}{n} I_{n-2}$ c) $I_n = -\frac{1}{n} \sin^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$ d) $I_n = \frac{1}{n} \sin^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$	K1	CO5

Cont...

	10	For $\int \cos 5x \, dx$, which reduction step is correct? a) $I_5 = \frac{1}{5} \cos^4 x \sin x + \frac{4}{5} I_3$ b) $I_5 = \frac{1}{5} \cos^4 x \sin x + \frac{4}{5} I_4$ c) $I_5 = -\frac{1}{5} \cos^4 x \sin x + \frac{4}{5} I_3$ d) $I_5 = \frac{1}{5} \cos^4 x \cos x + \frac{4}{5} I_3$	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.	Define the Cayley Hamilton Theorem for the matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{bmatrix}$	K1	CO1
		(OR)		
	11.b.	Find the eigen values and eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$		
2	12.a.	Expand $\cos \theta$ in terms of $\sin \theta$.	K2	CO2
		(OR)		
	12.b.	If α and β are the roots of the equation $t^2 - 2t + 2 = 0$ and if $\cot \phi = x + 1$, Prove that $\alpha^8 + \beta^8 = 32$.		
3	13.a.	Find the coefficient of x^5 in the expansion of $(1 + x + x^2 + x^3 + x^4)^6$	K3	CO3
		(OR)		
	13.b.	Show that $\log \sqrt{12} = 1 + \left(\frac{1}{2} + \frac{1}{3}\right)\frac{1}{4} + \left(\frac{1}{4} + \frac{1}{5}\right)\frac{1}{4^2} + \left(\frac{1}{6} + \frac{1}{7}\right)\frac{1}{4^3} + \dots \infty$		
4	14.a.	Show that if $y = (ax + b)^m$, then find $D^n(y)$.	K3	CO4
		(OR)		
	14.b.	Show that if $y = \log(ax + b)$, then find $D^n(y)$		
5	15.a.	Construct the reduction formula for $\int \sin^n x \, dx$.	K3	CO5
		(OR)		
	15.b.	Solve $\int_0^{\pi/2} x(1 - x^2)^{\frac{1}{2}} dx$.		

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 matrix which breaks down $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ into a diagonal matrix and perform diagonalization.	K1	CO1
2	17	Show that $64(\cos^8 \theta + \sin^8 \theta) = \cos 8\theta + 28 \cos 4\theta + 35$.	K3	CO2
3	18	Show that $\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \dots = 2 \log 2 - 1$.	K3	CO3
4	19	Evaluate y_n where $y = \frac{3}{(x+1)(2x-1)}$.	K6	CO4
5	20	Find the reduction formula for $\int \cos^n x \, dx$ and hence derive $\int_0^{\frac{\pi}{2}} \cos x \, dx$.	K1	CO5