PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(First Semester)
Branch - **STATISTICS**

MATHEMATICS- I FOR STATISTICS

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 is called _____ if its determinant is zero. (i) non singular (ii) singular (iii) zero matrix (iv) null matrix	K1	CO1
	2	If $A = (a_{ij})$ is a skew Hermitian matrix then a_{ij} = _____. (i) a_{ji} (ii) $-a_{ji}$ (iii) $\overline{a_{ji}}$ (iv) $-\overline{a_{ji}}$	K2	CO1
2	3	If α, β, γ are the roots of $2x^3 + 3x^2 + 5x + 6 = 0$, then $\sum \alpha$ = _____. (i) $-\frac{2}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{3}{2}$ (iv) $-\frac{3}{2}$	K1	CO2
	4	The reciprocal equation of odd degree with unlike signs for its coefficients always have a factor of the form (i) $x + 1$ (ii) $x - 1$ (iii) $x^2 - 1$ (iv) $x^2 + 1$	K2	CO2
3	5	$D^{n(e^{ax})}$ = _____. (i) ae^{ax} (ii) e^{ax} (iii) $a^n e^{ax}$ (iv) e^{anx}	K1	CO3
	6	If $y = ae^{mx} + be^{-mx}$ then $\frac{d^2y}{dx^2}$ = _____. (i) m^2y (ii) $-m^2y$ (iii) m^2x (iv) $-m^2x$	K2	CO3
4	7	The formula for finding the radius of curvature ρ is _____. (i) $\frac{(1+y')^{3/2}}{y''}$ (ii) $\frac{(1+(y')^2)^{2/3}}{y''}$ (iii) $\frac{(1+(y')^2)^{3/2}}{y''}$ (iv) $\frac{(1-(y')^2)^{3/2}}{y''}$	K1	CO4
	8	The locus of the centre of curvature for a curve is called _____. (i) involute (ii) radius of curvature (iii) evolute (iv) maximum of the curve	K2	CO4
5	9	What is the value of $\int \tan^2 x dx$. (i) $x - tanx$ (ii) $tanx - x$ (iii) $tanx - x^2$ (iv) $x^2 - tanx$	K1	CO5
	10	$\int \frac{dx}{\sqrt{9-x^2}}$ = _____. (i) $\sin^{-1}\left(\frac{x}{3}\right)$ (ii) $\sin^{-1}\left(\frac{3}{x}\right)$ (iii) $\sin^{-1}\left(\frac{x}{9}\right)$ (iv) $\sin^{-1}\left(\frac{9}{x}\right)$	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.	If A and B are Hermitian, then prove that $AB + BA$ is Hermitian and $AB - BA$ is Skew-Hermitian.	K1	CO1
		(OR)		
	11.b.	Find the rank of the matrix $\begin{pmatrix} 1 & 1 & -3 & -1 \\ 4 & -2 & 6 & 8 \\ 15 & -3 & 9 & 21 \end{pmatrix}$.		
2	12.a.	Solve the equation $32x^3 - 48x^2 + 22x - 3 = 0$ whose roots are in A.P.	K3	CO2
		(OR)		
	12.b.	Develop the equation whose roots are the roots of $x^4 - x^3 - 10x^2 + 4x + 24 = 0$ increased by 2.		
3	13.a.	Verify Euler's theorem for the function $u = x^3 + y^3 + z^3 + 3xyz$.	K2	CO3
		(OR)		
	13.b.	If $u = x^2y^3, x = logt, y = e^t$ find $\frac{du}{dt}$.		
4	14.a.	Find the centre of curvature of the curve $y = 3x^3 + 2x^2 - 3$ at $(0,-3)$.	K1	CO4
		(OR)		
	14.b.	Find the radius of curvature for the curve $y^2 = x^3 + 8$ at $(-2,0)$.		
5	15.a.	Simplify : $\int \sin^4 x dx$	K4	CO5
		(OR)		
	15.b.	Simplify : $\int \frac{dx}{(x+2)\sqrt{x+3}}$.		

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 the matrix $A = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.	K1	CO1
2	17	Solve $4x^4 - 20x^3 + 33x^2 - 20x + 4 = 0$.	K3	CO2
3	18	Identify $\frac{du}{dt}$ from $u = x^3y^2 + x^2y^3$ where $x = at^2, y = 2at$.	K3	CO3
4	19	Examine : The evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.	K4	CO4
5	20	Show that $\int_0^{\frac{\pi}{2}} \log(\sin x) dx = \frac{\pi}{2} \log\left(\frac{1}{2}\right)$	K2	CO5

Z-Z-Z END