

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(First Semester)

Branch - **STATISTICS**

MATHEMATICS – I / 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	If $A = \begin{bmatrix} 3 & 2 & 5 \\ 7 & -1 & 0 \\ -1 & 3 & 4 \end{bmatrix}$ then the transpose of A is _____. a) $\begin{bmatrix} 3 & 7 & -1 \\ 2 & -1 & 3 \\ 5 & 0 & 4 \end{bmatrix}$ b) $\begin{bmatrix} 2 & -1 & 3 \\ 3 & 7 & -1 \\ 5 & 0 & 4 \end{bmatrix}$ c) $\begin{bmatrix} 7 & 3 & -1 \\ -1 & 2 & 3 \\ 0 & 5 & 4 \end{bmatrix}$ d) $\begin{bmatrix} 5 & 3 & 2 \\ 0 & 7 & -1 \\ 4 & -1 & 3 \end{bmatrix}$	K1	CO1
	2	If $A = \begin{pmatrix} 2+i & 3 & 4-i \\ i & 2 & 3+i \\ 2+i & 3 & 4-i \end{pmatrix}$ then $\bar{A} =$ _____. a) $\begin{pmatrix} 2+i & 3 & 4+i \\ i & 2 & 3-i \\ 2+i & 3 & 4-i \end{pmatrix}$ b) $\begin{pmatrix} i & 2 & 3+i \\ 2+i & 3 & 4-i \end{pmatrix}$ c) $\begin{pmatrix} 2+i & -3 & 4-i \\ i & -2 & 3+i \end{pmatrix}$ d) $\begin{pmatrix} 2-i & 3 & 4+i \\ -i & 2 & 3-i \end{pmatrix}$	K2	CO2
2	3	If α and β are the roots of $2x^2 + 3x + 5 = 0$, then the value of $\alpha\beta$ is _____. a) $\frac{3}{2}$ b) $\frac{7}{2}$ c) $\frac{5}{2}$ d) $\frac{9}{2}$	K1	CO1
	4	The equation after multiplying the roots of $x^3 - 3x + 1 = 0$ by 10 is _____. a) $x^3 - 300x + 1000 = 0$ b) $x^3 + 300x - 1000 = 0$ c) $x^3 - 30x + 100 = 0$ d) $x^3 - 300x + 1 = 0$	K2	CO2
3	5	If $y = \frac{x+1}{x+2}$ then $\frac{dy}{dx} =$ _____. a) $\frac{-1}{(x+2)^2}$ b) $\frac{1}{(x+2)^2}$ c) $\frac{2}{(x+2)^2}$ d) $\frac{-2}{(x+2)^2}$	K1	CO1
	6	If $u = x^3y^4$ where $x = t^3$ and $y = t^2$ then $\frac{du}{dt} =$ _____. a) $15t^{16}$ b) $13t^{16}$ c) $17t^{16}$ d) $11t^{16}$	K2	CO2
4	7	The value of ρ for the cycloid $s = 4a \sin \psi$ is _____. a) $4a \cos \psi$ b) $-4a \cos \psi$ c) $\sin \psi$ d) $\cos \psi$	K1	CO1
	8	The locus of the centre of curvature for a curve is called its _____. a) evolute b) chord c) origin d) tangent	K2	CO2
5	9	$\int (2x+1)^4 dx =$ _____. a) $\frac{(2x+1)^5}{5}$ b) $\frac{(2x+1)^5}{10}$ c) $(2x+1)^5$ d) $\frac{(2x+1)^4}{8}$	K1	CO1
	10	The value of $\int \log x \, dx$ is _____. a) $x \log x - x$ b) $\log x$ c) $\log x - x$ d) $\log x + x$	K2	CO2

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.	If $A = \begin{bmatrix} 3 & -4 \\ 1 & 1 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 3 & 4 \end{bmatrix}$, show that $(AB)' = B'A'$.	K2	CO3
		(OR)		
	11.b.	Find the rank of the matrix $\begin{pmatrix} 4 & -5 & 1 & 2 \\ 3 & 1 & -2 & 9 \\ 1 & 4 & 1 & 5 \end{pmatrix}$.		
2	12.a.	Solve the equation $x^3 - 12x^2 + 39x - 28 = 0$ when the roots are in Arithmetic progression.	K3	CO2
		(OR)		
	12.b.	Increase by 7 the roots of the equation $3x^4 + 7x^3 - 15x^2 + x - 2 = 0$ and find the transformed equation.		
3	13.a.	If $u = \tan^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin u \cos u$.	K2	CO3
		(OR)		
	13.b.	Find n^{th} derivative of $\frac{x-2}{(x+2)(x-1)^2}$.		
4	14.a.	Prove that the radius of curvature at any point of the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$ is $4a \cos \frac{\theta}{2}$.	K3	CO2
		(OR)		
	14.b.	Find the radius of curvature at (x, y) for the curve $a^2y = x^3 - a^3$.		
5	15.a.	Evaluate $\int \sin 2x \cos x \, dx$.	K2	CO3
		(OR)		
	15.b.	Evaluate $\int \frac{3x-1}{(1-x)^2(1+x)} \, dx$.		

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 eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 1 & 1 \\ 3 & -1 \end{pmatrix}$.	K3	CO2
2	17	Solve $4x^4 - 20x^3 + 33x^2 - 20x + 4 = 0$.	K3	CO5
3	18	If $r^2 = x^2 + y^2$, then show that $\frac{\partial^2 r}{\partial x^2} + \frac{\partial^2 r}{\partial y^2} = \frac{1}{r} \left[\left(\frac{\partial r}{\partial x} \right)^2 + \left(\frac{\partial r}{\partial y} \right)^2 \right]$.	K3	CO2
4	19	Find the evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.	K3	CO5
5	20	Evaluate $\int \sin^7 x \, dx$.	K3	CO5