TOTAL PAGES : 2

25STU103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(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.	Which of the following is a reciprocal equation? a) $x^4+2x^3+3x^2+2x+1=0$ b) $x^4+3x^2+2x+1=0$ c) $x^4 - 2x^3+3x^2+2x+1=0$ d) $x^4+2x^3+3x^2+2x=0$	K1	CO1
	2	If the roots of an equation are increased by h, the transformed equation is a) $f(x+h)=0$ b) $f(x-h)=0$ c) $f(h-x)=0$ d) $f(x)+h=0$	K2	CO1
2	3	Find the value of $\lim_{x\to 0}\frac{\sin x}{x}$. a) 0 b) 1 c) 2 d) infinity	K1	CO2
	4	Find the derivative of ln(sinx). a) cotx b) cosecx c) secx d) -cotx	K2	CO2
3	5	The function $f(x)=x^2$ has a) Maximum at x=0 b) Minimum at x=0 c) Both Maximum and Minimum d) None	K1	CO3
	6	The minimum of $f(x,y)=x^2+y^2$ subject to the condition x+y=1 is at a) (0,0) b) $\left(\frac{1}{2},\frac{1}{2}\right)$ c) (0,1) d) (1,0)	K2	CO3
4	7	If $f(r) = r^2$ where $r = \sqrt{x^2+y^2+z^2}$ then $\nabla f = ?$ a) (2x,2y,2z) b) (x,y,z) c) (r^2,r^2,r^2) d) (0,0,0)	K1	CO4
	8	Which of the function is always a scalar? a) gradient b) curl c) divergence d) vector potential	K2	CO4
5	9	Verify the differential equation: $(2xy+3)dx + (x^2+4y)dy = 0$ is a) Exact b) Not-Exact c) Homogeneous d) Linear	K1	CO5
	10	Using Bernoulli's Equation, if $\frac{dy}{dx} + y = xy^2$ where $v=y^{-1}$. Then the resulting linear equation is a) $\frac{dv}{dx} + v = -x$ b) $\frac{dv}{dx} - v = -x$ c) $\frac{dv}{dx} = v - x$ d) $\frac{dv}{dx} = -x$	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.	Solve the equation $x^4-14x^3+46x^2-42x+9=0$ given that $5-\sqrt{22}$ is a root.	K2	CO2
		(OR)		
	11.b.	Increase the roots of the equation $4x^5-2x^3+7x-3=0$ by 2.		
2	12.a.	State and Prove Rolle's Theorem.	K3	CO3
		(OR)		
	12.b.	State and Prove Lagrange's first mean value theorem.		
3	13.a.	Prove that $u=x^3+y^3-3axy$ is max or min at $x=y=a$ according as negative or positive.	K4	CO4
		(OR)		
	13.b.	Find the shortest distance from the point(1,0) to the parabola $y^2=4x$.		
4	14.a.	If $\nabla\varphi = 2xyz^3 i + x^2z^3 j + 3x^2yz^2 k$ then find $\varphi(x,y,z)$ and show that $\varphi(1,-2,2) = 4$.	K4	CO4
		(OR)		
	14.b.	Find the unit normal to the surface $x=t, y=t^2, z=t^3$ at $t=1$.		
5	15.a.	Solve $\frac{dy}{dx} = \frac{y^3+3x^2y}{x^3+3xy^2}$.	K5	CO5
		(OR)		
	15.b.	Solve $xyp^2+p(3x^2-2y^2)-6xy=0$.		

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	Solve $6x^4-25x^3+37x^2-25x+6=0$.	K3	CO2
2	17	State and Prove Cauchy's Mean value theorem.	K4	CO2
3	18	Prove that the rectangular solid of maximum volume which can be inscribed in a given sphere is a cube.	K4	CO3
4	19	Prove that $\nabla^2(r^n r) = n(n+3)r^{n-2}r$.	K4	CO4
5	20	Solve $4y = x^2 + p^2$.	K4	CO5

Z-Z-Z END