

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2026
(First Semester)

Branch - **MATHEMATICS**

CALCULUS - I

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 $r(\vec{t}) = (3\cos t, 3\sin t, 4t)$ then the curve represents a) parabola b) helix c) elliptic d) circle	K1	CO1
	2	Find the arc length of parametric curve $x=\cos t, y=\sin t, 0 \leq t \leq \frac{\pi}{2}$? a) 1 b) π c) $\frac{\pi}{2}$ d) 0	K2	CO1
2	3	Find the value of $\lim_{x \rightarrow \infty} \frac{2x^2+3}{5x^2+1}$ is a) 0 b) 2/5 c) 1 d) infinity	K1	CO2
	4	For the surface $z=x^2+y^2$ the tangent plane at (1,1,2) is a) $z-2=2(x-1)+2(y-1)$ b) $z+2=2(x-1)+2(y-1)$ c) $z-2=2(x-1)-2(y-1)$ d) $z-2=2(x-1)2(y-1)$	K2	CO2
3	5	If $z=f(x,y)$ with $x=x(t)$ and $y=y(t)$ then $\frac{dz}{dt}$ is a) $f_x \frac{dx}{dt} + f_y \frac{dy}{dt}$ b) $f_x \frac{dx}{dt} - f_y \frac{dy}{dt}$ c) $\frac{dx}{dt} + f_y \frac{dy}{dt}$ d) $f_x \frac{dx}{dt} + \frac{dy}{dt}$	K1	CO3
	6	Lagrange's Multiplier is used to solve a) Ordinary differential equations b) Extrema of an object subject to constraints c) Linear systems d) Integrate functions	K2	CO3
4	7	Find the value of $\int_0^1 \int_0^1 xy dx dy$? a) $\frac{1}{4}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) 1	K1	CO4
	8	Which one of the following is correct for surface area of a sphere of radius R? a) $4\pi R^2$ b) $2\pi R^2$ c) $3\pi R^2$ d) πR^2	K2	CO4
5	9	Find the value of $\int_0^2 \int_0^2 \int_0^2 1 dx dy dz$? a) 2 b) 4 c) 6 d) 8	K1	CO5
	10	The order of integration in a triple integral can be if a) Limits are constants b) Function is continuous c) Domain is simple d) None	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.	Find the parametric equations for the tangent line to the helix with parametric equations $x=2\cos t, y=\sin t, z=t$ at the point $(0, 1, \frac{\pi}{2})$.	K3	CO3
		(OR)		
	11.b.	Find the curvature of the parabola $y=x^2$ at the points $(0,0), (1,1), (2,4)$.		
2	12.a.	Verify the limit exists for given function $(x) = \frac{xy^2}{x^2+y^4}$.	K3	CO2
		(OR)		
	12.b.	Find the range and domain of $g(x, y) = \sqrt{9 - x^2 - y^2}$		
3	13.a.	If $u = x^4y + y^2z^3$ where $x=r\cos t, y=rs^2e^{-t}, z=r^2\sin t$. Find $\frac{\partial u}{\partial s}$ when $r=2, s=1, t=0$.	K3	CO3
		(OR)		
	13.b.	Find the directional derivative of the function $f(x, y) = x^2y^3 - 4y$ at the point $(2, -1)$ in the direction of the vector $v = 2i + 5j$.		
4	14.a.	Find the volume of the solids that is bounded by the elliptic paraboloid $x^2 + 2y^2 + z = 16$ the plane $x=2, y=2$ and three co-ordinate planes.	K4	CO4
		(OR)		
	14.b.	Evaluate $\iint_D (x + 2y) dA$ where D is the region bounded by the parabola $y=2x^2, y=1+x^2$.		
5	15.a.	Evaluate $\iiint_B xyz^2 dv$ where B is the rectangular box given by $0 \leq x \leq 1, -1 \leq y \leq 2, 0 \leq z \leq 3$.	K3	CO5
		(OR)		
	15.b.	Evaluate $\iiint_B e^{(x^2+y^2+z^2)} dV$ where B is the unit ball $x^2 + y^2 + z^2 \leq 1$		

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 equations of the normal plane and osculating plane of the helix at the point $P(0, 1, 2\pi)$.	K3	CO2
2	17	The dimension of a rectangular box are measured to be 75cm, 60cm, 40cm and each measurement is correct with 0.2cm. Use differentiable to estimate the largest possible error when the volume of the box is calculated from these measurements.	K4	CO3
3	18	Find the local maximum and minimum and saddle points $f(x, y) = x^4 + y^4 - 4xy + 1$	K4	CO4
4	19	Find the mass and center of mass of a triangular lamina with vertices $(0,0), (1,0)$ and $(0,2)$ if the density function is $\rho(x, y) = 1 + 3x + y$.	K4	CO5
5	20	Find the center of mass of a solid of constant density that is bounded by the parabolic cylinder $x=y^2$ and the planes $x=z, z=0, x=1$.	K3	CO5