22MAU204N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Branch - **MATHEMATICS**

CALCULUS - II

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	The sequence $a_n = (-1)^n$ is (a) Convergent (b) Divergent and Oscillating (c) Not oscillating (d) Divergent	K1	CO1
	2	Every bounded monotonic sequence is (a) Convergent (b) Divergent (c) Neither converges nor diverges (d) None	K2	
2	3	A conditionally convergent series (a) Diverges (b) Diverges conditionally (c) Not converges absolutely (d) None	K1	CO2
	4	If the terms of the alternating series decreases and its limit tends to zero then the alternating series is (a) Convergent (b) Divergent (c) Oscillating (d) None	K2	
3	5	The geometric series $\sum ar^n$ converges if (a) $\lvert r \rvert < 1$ (b) $\lvert r \rvert \geq 1$ (c) $r = 0$ (d) None	K1	CO3
	6	If $\lim_{n\to\infty} a_n = 0$, then the series $\sum a_n$ a) Converges (b) Diverges (c) May converge or diverge (d) None	K2	
4	7	If a vector field $\boldsymbol{F} = \nabla f$, then f is called a (a) Potential function of $\boldsymbol{F}$ (b) Divergent field (c) Convergent field (d) None	K1	CO4
	8	Laplace equation is given by (a) $\nabla f = 0$ (b) $\nabla^2(f) = 0$ (c) $\nabla^3(f) = 0$ (d) None	K2	
5	9	The Divergence of $F(x,y,z) = 2xz\,\vec{i} + xyz\,\vec{j} + 5xy\,\vec{k}$ is (a) $2z + xz$ (b) $2x + xy$ (c) Zero (d) None	K1	CO5
	10	The Green's Theorem relates a double integral to (a) a line integral (b) a double integral (c) a triple integral (d) None	K2	

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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.	Test the series $\sum_{n=1}^{\infty}\frac{1}{2^n-1}$ is convergence or divergence.	K3	CO1
		OR)		
	11.b.	The series $\sum_{n=1}^{\infty}\frac{2n^2+3n}{\sqrt{n^5+5}}$ converges - Disprove		
2	12.a.	Determine whether the series $\sum_{n=1}^{\infty}\frac{cosn}{n^2}$ is convergent or divergent.	K4	CO2
		(OR)		
	12.b.	Examine the convergence of the series $\sum_{n=1}^{\infty}\left\{\frac{2n+3}{3n+2}\right\}^n$		
3	13.a.	Find the Maclaurins series for $sinx$ and prove that it represents $sinx$ for all x.	K2	CO3
		(OR)		
	13.b.	Approximate the function $f(x)=\sqrt[3]{x}$ by a Taylor polynomial of degree 2 at $a=8$.		
4	14.a.	Evaluate $\oint_c (3y-e^{sinx})dx+\left(7x+\sqrt{y^4+1}\right)dy$, where C is the circle $x^2+y^2+=9$.	K3	CO4
		(OR)		
	14.b.	Find curl $\boldsymbol{F}$ where, $\boldsymbol{F}(x,y,z)=xz\,\vec{\imath}+xyz\,\vec{\jmath}-y^2\vec{k}$ and hence show that $\boldsymbol{F}$ is not conservative.		
5	15.a.	Find the flux of the vector field $\boldsymbol{F}(x,y,z)=z\,\vec{\imath}+y\,\vec{\jmath}+x\,\vec{k}$, over the unit sphere $x^2+y^2+z^2=1$.	K3	CO5
		(OR)		
	15.b.	Find the tangent plane to the surface with parametric equations $x=u^2,\ y=v^2,z=u+2v$ at the point $(1,1,3)$.		

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	Prove that the harmonic series $\sum_{n=1}^{\infty}\frac{1}{n}$ is divergent .	K4	CO1
2	17	State and prove the Ratio test.	K3	CO2
3	18	Find the radius of convergence and interval of convergence of the series $\sum_{n=0}^{\infty}\frac{(-3)^n x^n}{\sqrt{n+1}}$	K3	CO3
4	19	(a) If $\boldsymbol{F}(x,y)=(3+2xy)\vec{\imath}+(x^2-3y^2)\vec{\jmath}$, Determine a function f such that $\boldsymbol{F}=\nabla f$ (b) Evaluate the line integral $\oint_c \boldsymbol{F}.dr$, where C is the curve given by $\boldsymbol{r(t)}=e^t sint\,\vec{\imath}+e^t cost\,\vec{\jmath}, 0\le t\le\pi$.	K4	CO4
5	20	Using Stoke's Theorem compute $\iint_s curl\,\boldsymbol{F}.ds$, where $\boldsymbol{F}(x,y,z)=xz\,\vec{\imath}+yz\,\vec{\jmath}+xy\,\vec{k}$ and S is the part of the sphere$x^2+y^2+z^2=4$ that lies inside the cylinder $x^2+y^2=1$ and above the xy- plane.	K5	CO5

Z-Z-Z END