PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(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	If $\lim_{n\to\infty} \lvert a_n \rvert = 0$, then $\lim_{n\to\infty} a_n$ is (a) Zero (b) Divergent and Oscillating (c) Not oscillating (d) Divergent	K1	CO1
	2	The sequence $\left\{\frac{3}{n+5}\right\}$ is _________ sequence. (a) decreasing (b) increasing (c) Neither decreasing nor increasing (d) None	K2	
2	3	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	K1	CO2
	4	Does the rearrangement of a series $\sum a_n$ gives the same sum? (a) yes (b) No (c) May or May not (d) None	K2	
3	5	The radius of convergence of the geometric series $\sum_0^\infty x^n$ is (a) 1 (b) 0 (c) >1 (d) <1	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 f is a scalar function then its gradient is given by the vector field (a) ∇f (b) $\nabla\, X\, \boldsymbol{F}$ (c) $\nabla . \boldsymbol{F}$ (d) None	K1	CO4
	8	If $\boldsymbol{F} = \nabla f$, then f is called the $(a) Potential\ function\ for\ \boldsymbol{F}$ $(b) Divergent\ field$ (c) Convergent field (d) None	K2	
5	9	A normal vector to a tangent plane consisting of tangent vectors $\overrightarrow{r_u}$ and $\overrightarrow{r_v}$ is given by (a) $\overrightarrow{r_u}\ X\ \overrightarrow{r_v}$ (b) $\overrightarrow{r_u} . \overrightarrow{r_v}$ (c) $\nabla \overrightarrow{r_u}$ (d) $\nabla \overrightarrow{r_v}$	K1	CO5
	10	The Stoke's Theorem relates a surface integral to (a) a line integral (b) a double integral (c) a triple integral (d) None	K2	

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.	Show that the sequence $a_n = \left\{\frac{n}{n^2+1}\right\}$ is decreasing	K3	CO1
		(OR)		
	11.b.	Examine the convergence of the geometric series $\sum_{n=1}^{\infty} ar^{n-1}$.		

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2	12.a.	Test the series $\sum_{n=1}^{\infty} \frac{(-1)^n n^3}{3^n}$ for absolute convergence.	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.	Apply Ratio test to find for what values of x does the series $\sum_{n=1}^{\infty} \frac{(x-3)^n}{n}$ converge.	K2	CO3
	(OR)			
	13.b.	Find a power series representation of $\frac{x^3}{x+2}$.		
4	14.a.	Evaluate $\int_C \boldsymbol{F}.\boldsymbol{dr}$, where $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = xy\,\vec{i} + yz\,\vec{j} + zx\,\vec{k}$ and C is the twisted cubic curve given by $x = t,\ y = t^2, z = t^3,\ 0 \le t \le 1$.	K3	CO4
	(OR)			
	14.b.	If $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = y^2\,\vec{i} + (2xy + e^{3z})\,\vec{j} + 3ye^{3z}\,\vec{k}$, find a function f such that $\boldsymbol{F} = \nabla f$.		
5	15.a.	Using Divergence theorem, find the flux of the vector field $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = z\,\vec{i} + y\,\vec{j} + x\,\vec{k}$, over the unit sphere $x^2 + y^2 + z^2 = 1$.	K3	CO5
	(OR)			
	15.b.	Find the normal vector to the tangent plane of 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	Is the series $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ converge ? If so, find its sum.	K4	CO1
2	17	State and prove the Root test.	K3	CO2
3	18	(a) Find the interval of convergence of the series $\sum_{n=0}^{\infty} \frac{n(x+2)^n}{(3)^{n+1}}$ (b) Find the Taylor series for $f(x) = e^x$ at $a = 2$	K3	CO3
4	19	(a) Verify whether the function $\boldsymbol{F}$ where, $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = xz\,\vec{i} + xyz\,\vec{j} - y^2\,\vec{k}$ is conservative or not. (b) Apply Green's Theorem to compute $\int_C (3y - e^{sinx})dx + (7x + \sqrt{y^4 + 1})dy$, where C is the circle $x^2 + y^2 = 9$.	K4	CO4
5	20	Using Stoke's Theorem, compute $\iint_C \boldsymbol{F}.\boldsymbol{dr}$, where $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) = -y^2\,\vec{i} + x\,\vec{j} + z^2\,\vec{k}$ where C is the curve of intersection of the plane $y + z = 2$ and the cylinder $x^2 + y^2 = 1$.	K5	CO5

Z-Z-Z END