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PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(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 p-series $\sum \frac{1}{n^p}$ is convergent if ____. a) $p < 1$ b) $p \leq 1$ c) $p = 1$ d) $p > 1$.	K1	CO1
	2	If $\sum v_n$ is convergent and $\lim_{n\to\infty} \frac{u_n}{v_n} \neq 0$ then $\sum u_n$ is ____. a) convergent b) divergent c) convergent or divergent d) none of these.	K2	CO1
2	3	The series $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} - \cdots$ is ______. a) convergent b) divergent c) absolutely convergent d) conditionally convergent.	K1	CO2
	4	$\sum a_n$ be a series of positive terms, then the Cauchy's root test $\sum a_n$ is convergent if $\lim_{n\to\infty} (a_n)^{\frac{1}{n}}$ is __. a) 0 b) > 1 c) < 1 d) = 1.	K2	CO2
3	5	The domain of the Bessel function $J_0(x)$ is ____. a) $(0, \infty)$ b) $(-\infty, 0)$ c) $(-1, 1)$ d) $(-\infty, \infty)$.	K1	CO3
	6	Taylor series of the function f at a = 0 is called _____series. a) Laurent b) Maclaurin c) Gregory d) harmonic.	K2	CO3
4	7	Green theorem is a particular case of ______ theorem. a) Gauss divergence b) Bessel c) Cauchy d) Stokes.	K1	CO4
	8	If $\vec{F} = 3x^2y\vec{i} - 4xy^2\vec{j} + 2xyz\vec{k}$ then div $\vec{f}$ at (1, 2, 3) is ____. a) 0 b) 1 c) 2 d) 3	K2	CO4
5	9	The parametric representation of the sphere $x^2 + y^2 + z^2 = a^2$ is ____. a) $x = a\sin\phi\cos\phi$, $y = a\sin\theta\sin\theta$, $z = a\cos\phi$ b) $x = a\sin\theta\cos\theta$, $y = a\sin\phi\sin\phi$, $z = a\sin\phi$ c) $x = a\sin\phi\cos\theta$, $y = a\sin\phi\sin\theta$, $z = a\cos\phi$ d) $x = a\sin\phi\sin\theta$, $y = a\cos\phi\cos\theta$, $z = a\sin\theta$.	K1	CO5
	10	Gauss divergence theorem connects ________. a) volume integral and surface integral b) surface integral and volume integral c) line integral and volume integral d) line integral and surface integral.	K2	CO5

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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.	Evaluate: $\lim_{n\to\infty}\left(\frac{1^3+2^3+3^3+\cdots+n^3}{n^4}\right)$.	K3	CO1
		(OR)		
	11.b.	Test for convergence $\frac{2}{1^p}+\frac{3}{2^p}+\frac{4}{3^p}+\cdots$.		
2	12.a.	Discuss the convergence of the series $\frac{1}{\log 2}-\frac{1}{\log 3}+\frac{1}{\log 4}-\frac{1}{\log 5}+\cdots$.	K4	CO2
		(OR)		
	12.b.	Examine the convergence of the series $\sum\frac{n^3}{3^n}$.		
3	13.a.	Find the radius of convergence and interval of convergence of the series $\sum_{n=1}^{\infty}\frac{n!}{n^n}x^n$.	K3	CO3
		(OR)		
	13.b.	Find the Taylor series generated by $f(x)=\frac{1}{x}$ at a = 2.		
4	14.a.	If $\vec{F}=xz\vec{i}+yz\vec{j}+z^2\vec{k}$, evaluate $\int_C \vec{F}\cdot d\vec{r}$ over C from (0, 0, 0) to (1, 1, 1), where C is given by $x=t$, $y=t^2$, $z=t^3$.	K3	CO4
		(OR)		
	14.b.	Find the divergence and curl of $\vec{F}=x^2y\vec{i}+zy^2\vec{j}+xyz^3\vec{k}$.		
5	15.a.	Evaluate $\iint \vec{A}\cdot\vec{n}\,dS$ if $\vec{A}=18z\vec{i}-12\vec{j}+3y\vec{k}$ and S is the surface 2x+3y+6z = 12 in the first octant.	K4	CO5
		(OR)		
	15.b.	Evaluate, by Stoke's theorem $\int_C (e^x dx+2y dy-dz)$ where C is the curve $x^2+y^2=4$, z = 2.		

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	Test the convergence of $\sum_{n=1}^{\infty}\sqrt{\frac{3^n-1}{2^n+1}}$.	K4	CO1
2	17	Examine the convergence of the series $\sum\frac{(2n+1)^n x^n}{n^{n+1}}$.	K4	CO2
3	18	Represent $f(x)=\sin x$ as the sum of its Taylor series centered at $\frac{\pi}{3}$.	K3	CO3
4	19	Verify Green's theorem evaluate $\int_C (x^2-y^2)dx+2xydy$ where C is the boundary of the region bounded by the lines x = 0, x = a, y = 0, y = b.	K3	CO4
5	20	Evaluate $\iint \vec{F}\cdot\vec{n}\,dS$ if $\vec{F}=(x+y)\vec{i}+x\vec{j}+z\vec{k}$ and S is the surface of the cube bounded by the planes x = 0, x = 1, y = 0, y = 1, z = 0, z = 1.	K3	CO5

Z-Z-Z END