

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Second Semester)

Branch – BIOCHEMISTRY

MATHEMATICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Question No.	Question	K Level	CO
1	If $\cos \theta + i \sin \theta = x$, then $x + \frac{1}{x} =$ _____ (i) $2i \sin \theta$ (ii) $2 \cos \theta$ (iii) $\cos h \theta$ (iv) $\sin h \theta$	K1	CO1
2	$\cos h 2x + \sin h 2x =$ _____ (i) 1 (ii) $\sin h 2x$ (iii) -1 (iv) $\cosh 2x$	K2	CO1
3	The product of eigenvalues of a matrix is equal to _____ (i) Determinant of A (ii) Trace of A (iii) Rank of A (iv) Inverse of A	K1	CO2
4	The Cayley–Hamilton theorem states that: (i) Every matrix is invertible (ii) A matrix satisfies its own characteristic equation (iii) Eigenvalues are always real (iv) Determinant is always non-zero	K2	CO2
5	If $y = \tan x$ then the derivative of y' is _____ (i) $\sec x$ (ii) $\sec^2 x$ (iii) $\tan^2 x$ (iv) $\tan x \sec x$	K1	CO3
6	The value of $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} =$ _____ (i) 1 (ii) -1 (iii) 0 (iv) θ	K2	CO3
7	The equation $\frac{dy}{dx} = \frac{x+y}{x}$ is _____ (i) Linear (ii) Homogeneous (iii) Exact (iv) Bernoulli	K1	CO4
8	An equation $M dx + N dy = 0$ is exact if (i) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (ii) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (iii) $M = N$ (iv) $M + N = 0$	K2	CO4
9	Which of the following is the correct choice for u in integration by parts for $\int x e^x$ (i) $u = x$ (ii) $u = e^x$ (iii) $u = dx$ (iv) $x e^x$	K1	CO5
10	The value of the $\int_0^{\frac{\pi}{2}} \sin^7 x dx =$ _____ (i) $16/35$ (ii) $8/15$ (iii) $16\frac{\pi}{35}$ (iv) $8\pi/15$	K2	CO5

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SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Find approximately the value of θ in radians if $\frac{\sin \theta}{\sin \theta} = \frac{863}{864}$.	K3	CO1
	(OR)		
11.b.	Develop $\sin 5\theta$ as a series in powers of $\sin \theta$.		
12.a.	Experiment with the matrix $A = \begin{pmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{pmatrix}$ satisfies the equation $A(A - I)(A + 2I) = 0$.	K3	CO2
	(OR)		
12.b.	Identify the eigen values and eigen vectors of the matrix $\begin{pmatrix} 4 & 1 \\ 3 & 1 \end{pmatrix}$.		
13.a.	If $u = \log(\tan x + \tan y + \tan z)$, show that $\sin 2x \frac{\partial u}{\partial x} + \sin 2y \frac{\partial u}{\partial y} + \sin 2z \frac{\partial u}{\partial z} = 2$.	K4	CO3
	(OR)		
13.b.	Find $\frac{du}{dt}$ when $u = xy^2 + x^2y$; $x = at^2$; $y = 2at$.		
14.a.	Analyze $\frac{dy}{dx} = \frac{y^3 + 3x^2y}{x^3 + 3xy^2}$.	K4	CO4
	(OR)		
14.b.	Analyze $\frac{dy}{dx} - y \cot x = 2x \sin x$.		
15.a.	Examine $\int_0^1 x(1-x)^n dx$.	K4	CO5
	(OR)		
15.b.	Examine $\int_0^{\frac{\pi}{4}} \log(1 + \tan \theta) d\theta$.		

SECTION - C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Question No.	Question	K Level	CO
16	Develop $\sin^3 \theta \cos^5 \theta$ in a series of sines of multiples of θ .	K3	CO1
17	Apply Cayley Hamilton's theorem for the matrix $A = \begin{pmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{pmatrix}$ and find A^{-1} .	K3	CO2
18	a) Identify y' if $x^3 + y^3 = 3axy$. b) If $(x - c)(y - c) = 1 + c^2$ analyze that $(1 + x^2)y' + (1 + y^2) = 0$.	K4	CO3
19	Solve and analyze the Bernoulli's Equation $xy' + y = y^2 \log x$.	K4	CO4
20	Identify the reduction formula for $\int x^n \cos ax \, dx$ where $n \in \mathbb{N}$.	K4	CO5

Z-Z-Z

END