PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2025
(First Semester)

Branch - CHEMISTRY

MATHEMATICS – I FOR CHEMISTRY

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 locus of the centre of curvature for a curve is called the _____ of the curve. a) involute b) evolute. c) envelope d)cycloid	K1	CO1
	2	The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is____. a)2 b) $\sqrt{2}$ c) $3\sqrt{2}$ d) $2\sqrt{2}$	K2	CO1
2	3	$\int_{0}^{\pi/2} \cos^5 x \, dx =$_____ a) 2/7 b)15/8 c)1/15 d)8/15	K1	CO2
	4	$\int_{0}^{a} f(x)\,dx =$ _____ a) $\int_{0}^{a} f(x^2)\,dx$ b) $\int_{0}^{a} f(a+x)\,dx$ c) $\int_{0}^{a} f(a-x)\,dx$ d) $\int_{-a}^{a} f(x)\,dx$	K2	CO2
3	5	$\int_{0}^{1}\int_{0}^{2}\int_{0}^{3} z\,dz\,dy\,dx =$_____ a) 3/2 b) 6 c)9 d)9/2	K1	CO3
	6	The formula to find the total volume of solid of revolution is a) $2\pi\int_{-a}^{b}\int_{0}^{f(x)} y\,dy\,dx$ b) $\int_{a}^{b}\int_{0}^{f(x)} y\,dy\,dx$ c) $2\int_{a}^{b}\int_{0}^{f(x)} dy\,dx$ d) $4\pi\int_{a}^{b}\int_{0}^{f(x)} y\,dy\,dx$	K2	CO3
4	7	$\int_{x_0}^{x_n} f(x)dx = \frac{h}{2}$ [sum of the first and the last ordinates + 2(sum of the remaining ordinates) . This is _____ rule. a)Trapezoidal b) Newton's c)Simpson's three-eighths d) Simpson's one -third	K1	CO4
	8	Simpson's three-eighths rule is applicable only when n is a multiple of _____ a) 1 b)4 c) 3 d)2	K2	CO4
5	9	Which of the following is Euler's algorithm? a) $y_{n+1} = y_n + f(x, y_n), n = 0,1,2,...$ b) $y_{n+1} = y_n + hf(x_n, y), n = 0,1,2,...$ c) $y_{n+1} = hf(x_n, y_n), n = 0,1,2,...$ d) $y_{n+1} = y_n + hf(x_n, y_n), n = 0,1,2,...$	K1	CO5
	10	In second order Runke-Kutta algorithm, $\Delta y =$ _____ a) K_1 b) K_3 c) K_2 d) K_4	K2	CO5

SECTION - B (35 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks $(5 \times 7 = 35)$

Module No.	Question No.	Question	K Level	CO
1	11.a.	What is the radius of curvature of the curve $x^4 + y^4 = 2$ at the point (1,1)?	K3	CO1
		(OR)		
	11.b.	Prove that the (p,r) equation of the cardioid $r = a(1 - \cos\theta)$ is $p^2 = \dfrac{r^3}{2a}$.		
2	12.a.	If $f(x)$ is an even function of x, then prove that $\int_{-a}^{a} f(x)\,dx = 2\int_{0}^{a} f(x)\,dx$	K4	CO2
		(OR)		
	12.b.	Evaluate $\int x^n \log x\,dx$.		
3	13.a.	Evaluate $\iint xy\,dx\,dy$ taken over the positive quadrant of the circle $x^2 + y^2 = a^2$.	K3	CO3
		(OR)		
	13.b.	Find the area enclosed by the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.		
4	14.a.	From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46.	K5	CO4
		(OR)		
	14.b.	The population of a certain town is given below. Find the rate of growth of the population in 1931.		
5	15.a.	Using Taylor series method, find, correct to four decimal places, the value of $y(0.1)$, given $\dfrac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$.	K4	CO5
		(OR)		
	15.b.	Obtain the values of y at $x = 0.1, 0.2$ using R.K. method of second order for the differential equation $y' = -y,\ y(0) = 1$.		

Table for 14.a.:

Age x	45	50	55	60	65
Premium y	114.84	96.16	83.32	74.48	68.48

Table for 14.b.:

Year	1931	1941	1951	1961	1971
Population in thousands	40.62	60.80	79.95	103.56	132.65

SECTION -C (30 Marks)
Answer ANY THREE questions
ALL questions carry EQUAL Marks $(3 \times 10 = 30)$

Module No.	Question No.	Question	K Level	CO
1	16	Find the evolute of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.	K4	CO1
2	17	Find a reduction formula for $I_{m,n} = \int \sin^m x \cos^n x\,dx$ (m,n being positive integers).	K6	CO2
3	18	Find the volume and position of the centre of gravity of the tetrahedron bounded by the plane $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$ and the co-ordinate planes.	K5	CO3
4	19	Evaluate $\int_{-3}^{3} x^4\,dx$ by using i) Trapezoidal rule ii) Simpson's rule. Verify your results by actual integration.	K4	CO4
5	20	Solve $y' = y - x^2,\ y(0) = 1$ by Picard's method up to the third approximation. Hence find the value of $y(0.1),\ y(0.2)$	K5	CO5

Z-Z-Z   END