22CHU103N/22CHU103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(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 curvature is the rate of change of the direction of the_____ a) tangent b) slope c) normal d) origin	K1	CO3
	2	The radius of curvature for the curve at the point (-2,0) is _____ a) 2 b) 6 c) 5 d) 8	K2	CO1
2	3	$\int_{-a}^{+a} f(x)dx = 0$ if $f(x)$ is an _____ function a) odd b) even c)either odd or even d) neither odd nor even	K1	CO3
	4	$\int x^n cosax\, dx, then\ \ I_{n=}$_____ a) $x^n \frac{sinax}{a} + \frac{n}{a^2}x^{n-1}cosax - \frac{n(n-1)}{a^2}I_{n-2}$ b) $x^n \frac{sinax}{a} - \frac{n}{a^2}x^{n-1}cosax - \frac{n(n-1)}{a^2}I_{n-2}$ c) $x^n \frac{sinax}{a} + \frac{n}{a^2}x^{n-1}cosax + \frac{n(n-1)}{a^2}I_{n-2}$ d) $x^n \frac{sinax}{a} - \frac{n}{a^2}x^{n-1}cosax + \frac{n(n-1)}{a^2}I_{n-2}$	K2	CO2
3	5	The volume generated by the revolution of the cardioids r=a(1+cosθ) about its axis is a) $\frac{2}{3\pi a^3}$ b) $\frac{4}{3\pi a^3}$ c) $\frac{8}{3\pi a^3}$ d) $\frac{11}{3\pi a^3}$	K1	CO3
	6	Find the value of $\int_0^3 \int_3^4 x^2 y\, dy\, dx$ a) 36/2 b) 63/2 c) 76/2 d) 67/2	K2	CO2
4	7	$\Delta^2 y_0$ = _____. a) $y_2 - y_1 + y_0$ b) $y_2 - 2y_1 + y_0$ c) $2y_2 + 2y_1 + y_0$ d) $y_1 - y_0$	K1	CO3
	8	In Trapezoidal rule, the portion of curve is replaced by _____. a) straight line b) circular path c)parabolic path d) hyperbolic path	K2	CO1
5	9	_____ is a particular case of Runge-Kutta formulas of the second order. a) Taylor formula b) Picard's formula c) Euler's modified formula d) Milne's predictor formula	K1	CO3
	10	If $y'' = 1 - 2yy'$ with $y(0) = 1$ and $y_0' = -1$, then the initial value of y_0'' is---------- a) -1 b) 3 c) -8 d) 34	K2	CO2

Cont...

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.	Illustrate ρ at the point t of the curve $x = a(\cos t + t\sin t) and\ y = a(\sin t - t\cos t)$	K2	CO2
		(OR)		
	11.b.	Find the radius of curvature of the cardioid $r = a(1-\cos\theta)$		
2	12.a.	Integrate $\int x^2 \tan^{-1} x dx$	K3	CO2
		(OR)		
	12.b.	Evaluate $\int x^3 \cos 2x dx$		
3	13.a.	Evaluate $\iint xydxdy$ taken over the positive quadrant of the circle $x^2 + y^2 = a^2$	K3	CO3
		(OR)		
	13.b.	Find the centroid of the area enclosed by the parabola $y^2 = 4ax$, the axis of x and the latus rectum of the parabola.		
4	14.a.	Find the value of x=1.1 from the following x: 1.0 | 1.1 | 1.2 | 1.3 | 1.4 y: 43.1 | 47.7 | 52.1 | 56.4 | 60.8	K4	CO5
		(OR)		
	14.b.	Evaluate $\int_0^1 xe^x dx$ using Simpson's one-third rule.		
5	15.a.	Solve $\frac{dy}{dx} = x + y, y(0) = 1$, using Picard's method to compute y(0.1)	K4	CO5
		(OR)		
	15.b.	Using Runge-Kutta method of fourth order to find y(0.1) given that $\frac{dy}{dx} = \frac{2xy}{1+x^2} + 1, y(0) = 0$		

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	Show that in the parabola $y^2 = 4ax$ at the point 't' $\rho = -2a(1+t^2)^{3/2}, x = 2a + 3at^2, y = -2at^3$. Deduce the equation of the evolute.	K4	CO5
2	17	Integrate $\int (\log x)^3 x^4 dx$	K4	CO5
3	18	Find the volume and the position of the centre of gravity of the tetrahedron bounded by the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ and the coordinate planes.	K4	CO5
4	19	The population of a town in the census is given below. Estimate the population for the year 1895 and 1925. Year : x: 1891 | 1901 | 1911 | 1921 | 1931 Population :y (in thousands): 46 | 66 | 81 | 93 | 101	K4	CO5
5	20	Using Taylor series method find y at x = 1.1, 1.2 and 1.3 given $\frac{dy}{dx} = y + x^3$, $y(1)$=1.	K4	CO5

Z-Z-Z END