



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIRST SEMESTER – NOVEMBER 2022

UMT 1302 – MATHEMATICS FOR CHEMISTRY

Date: 01-12-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL the questions:

(10 × 2 = 20)

1. If $y = a \cos 2x + b \sin 3x$, find $\frac{dy}{dx}$.
2. Find the equation of the tangent to the curve $y = x^2$ at (1,2).
3. Write the expansion of $\log(1 + x)$.
4. Write the expansion of $e^x + e^{-x}$.
5. Evaluate $\int x^2 e^x dx$.
6. Evaluate $\int_0^{\frac{\pi}{2}} \sin^{10} x dx$.
7. State De Moivre's Theorem.
8. Write the expansion of $\sin n\theta$.
9. Define probability of an event.
10. For a binomial distribution the mean is 6 and the standard deviation is $\sqrt{2}$. Find the value of p and q .

PART – B

Answer any FIVE of the following:

(5 × 8 = 40)

11. Find the angle of intersection of the curves $r = a(1 + \cos\theta)$ and $r = b(1 - \cos\theta)$.
12. Sum the series $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$.
13. Find the sum to infinity of the series $1 + \frac{3}{2!} + \frac{5}{3!} + \frac{7}{4!} + \dots$.
14. Solve $\int \frac{x-1}{(x-2)(x-3)} dx$.
15. Determine $\int \frac{2x+1}{\sqrt{3+4x-x^2}} dx$.
16. Show that $\sin^5 \theta = \frac{1}{16} [\sin 5\theta - 5\sin 3\theta + 10\sin \theta]$.
17. Prove that $\frac{\cos 5\theta}{\cos \theta} = 1 - 12\sin^2 \theta + 16\sin^4 \theta$.
18. Determine the mean and standard deviation for the following table giving the age distribution of 542 members.

Age (in years)	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of Members	3	61	132	153	140	51	2

PART – C

Answer any TWO of the following:

(2 × 20 = 40)

19. Find the maximum or minimum or minimum values of $2(x^2 - y^2) - x^4 + y^4$.

20. Prove that $\sum_{n=0}^{\infty} \frac{5n+1}{(2n+1)!} = \frac{e}{2} + \frac{2}{e}$.

21. (i) Express $\cos 6\theta$ in terms of $\cos \theta$.

(ii) Evaluate $\int \frac{2x+1}{x^2+3x+1} dx$.

22. Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y):

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71