LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **APRIL 2023**

16/17/18UMT1AL03 – MATHEMATICS FOR CHEMISTRY - I

Date: 12-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer all the questions: **(10 × 2 = 20)**

1. Find $\frac{dy}{dx}$, if y = $4x^2$-3x+2.
2. Write the formula to find slope of the tangent in polar co-ordinates.
3. Write Binomial series.
4. Expand a^x in ascending powers of x, $'a'$ being positive.
5. Evaluate $\int \cos^n x\, dx$.
6. Find $\int xe^x\ dx$.
7. State De Moivre's Theorem.
8. Write the expansion of tan nθ.
9. Define probability of an event.
10. Write the formula to find standard deviation for the set of values $x_1, x_2, \ldots x_n$.

PART B

Answer any Five of the following: **(5 × 8 = 40)**

11. Find the angle at which the radius vector cuts the curve $\frac{1}{r} = 1 + ecos\theta$.
12. Find the angle of intersection of the curves $x^2 = 4y$ and $y^2 = 4x$.
13. Show that

$$\frac{e-1}{e+1} = \frac{\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}\ldots\ldots\infty}{\frac{1}{1!}+\frac{1}{3!}+\frac{1}{5!}\ldots\ldots\infty}$$

14. Evaluate

$$\int_0^{\pi} \frac{(\sin x)^{3/2}}{(\sin x)^{3/2}+(\cos x)^{3/2}}\, dx = \frac{\pi}{4}.$$

15. Determine $\int \frac{2dx}{(1-x)(1+x^2)}$.
16. Evaluate $\lim_{x\to 0} \frac{tanx-sinx}{sin^3 x}$.

17. Two bags contain respectively 10 white, 6 red and 9 black balls and 3 white, 7 red and 15 black balls. One ball is drawn from each bag. Find the probability that

    (i) Both balls are red

    (ii) Both balls are of same colour.

18. Determine the binomial distribution for which the mean is 4 and variance 3. Also find P(X=15).

PART – C

Answer any Two of the following: $(\mathbf{2 \times 20 = 40})$

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

20. Sum to infinity the series

$$\frac{2.4}{3.6} + \frac{2.4.6}{3.6.9} + \frac{2.4.6.8}{3.6.9.12} + \cdots \infty$$

21. Derive the reduction formula for $\int cos^n x \, dx$ where n is a positive integer.

22. (i) Prove that $\frac{\sin 7\theta}{\sin \theta} = 64cos^6\theta - 80cos^4\theta + 24cos^2\theta - 1$. (10 marks)

    (ii)For the data given below, calculate the rank correlation co-efficient.

X	21	36	42	37	25
Y	47	40	37	42	43

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