



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2016

MT 3101 - ALLIED MATHEMATICS FOR CHEMISTRY

Date: 12-11-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART A

Answer ALL the questions.

(10 X 2 = 20)

1. Differentiate $(x + 1)/\sqrt{x}$ with respect to x .
2. Prove that $\cosh^2 x - \sinh^2 x = 1$.
3. Solve $(D^2 - 3D + 2)y = 0$.
4. Integrate $(x + 2)^3$ with respect to x .
5. Write down the formula for $\log(1 + x)$.
6. Solve: $pq = 1$.
7. Write down the expansion of $\cos n\theta$.
8. Define Fourier Series.
9. Define Poisson distribution.
10. Find the arithmetic mean of the set $X = \{12, 14, 16, 18, 20\}$.

PART B

Answer any FIVE questions.

(5 X 8 = 40)

11. Find the maxima and minima of the function $2x^3 - 3x^2 - 36x + 10$.
12. Evaluate: $\int x^3 \cos 2x \, dx$.
13. Sum the series $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \frac{1+3+3^2+3^3}{4!} + \dots$ to .
14. Express $\sin 7\theta$ in terms of $\sin \theta$.
15. Define binomial distribution and determine the same for which the mean and variance are 4 and 3 respectively.
16. Differentiate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$.
17. Prove that $2^5 \cos^6 \theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10$.
18. Write a short note on normal distribution.

PART C

Answer any TWO questions.

(2 X 20 = 40)

19. (a) Find the angle of intersection of the cardioids $r = a(1 + \cos\theta)$ and $r = a(1 + \sin\theta)$.

(b) Prove that $\int_0^{\frac{\pi}{4}} \log(1 + \tan \theta) d\theta = \frac{\pi}{8} \log 2$. **(10+10)**

20. (a) Solve $(D^2 + 5D + 6)y = e^x$.

(b) Solve: $z = px + qy + \sqrt{1 + p^2 + q^2}$. **(10+10)**

21. (a) Obtain the Fourier expansion of $f(x) = x^2$ in the interval $[-\pi, \pi]$.

(b) Find the eigen values and eigen vectors of the matrix $\begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$. **(10+10)**

22. (a) Calculate the mean and standard deviation for the following data.

Class Interval	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency	3	61	132	153	140	51	2

(b) Sum the series to infinity $\frac{15}{16} + \frac{15.21}{16.24} + \frac{15.21.27}{16.24.32} + \dots$ **(10+10)**
