

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIRST SEMESTER – NOVEMBER 2018

MT 1102 – MATHEMATICS FOR CHEMISTRY

Date: 24-10-2018

Dept. No.

Max. : 100 Marks

Time: 01:00-04:00

Part A**Answer ALL the questions.****(10 × 2 = 20)**

- Evaluate: $\int_0^3 (x^3 + 2x - 3) dx$.
- Evaluate: $\int \frac{1}{1+16x^2} dx$.
- Write the expansions for $\log(1+x)$ and e^x .
- Show that $\log \frac{a+x}{a-x} = \frac{2ax}{a^2+x^2} + \frac{1}{3} \left(\frac{2ax}{a^2+x^2} \right)^3 + \frac{1}{5} \left(\frac{2ax}{a^2+x^2} \right)^5 + \dots$
- Write the expansion of $\cos \theta$ in ascending powers of θ .
- Define Fourier Series.
- Find the first order partial derivatives of $z = 2xy + 4x^2y^3$.
- Find the Complementary function of $\frac{d^2y}{dx^2} - 6 \frac{dy}{dx} + 9y = 0$.
- The mean and variance of binomial distribution are 4 and $4/3$ respectively. Find $P(X \geq 1)$.
- Define Poisson Distribution.

Part B**Answer any FIVE questions.****(5 × 8 = 40)**

- Evaluate $\int \frac{2x+3}{(x-1)(x+3)} dx$.
- Using Bernoulli's formula, evaluate $\int x^3 e^{4x} dx$.
- Find the maxima and minima of the function $x^3 + 3x^2 - 9x + 10$.
- Find the equation of tangent and normal to the curve $y^2 = \frac{x^2}{4-x}$ at the point (2, 2).
- Prove that $\frac{\sin 6\theta}{\sin \theta} = 32 \cos^5 \theta - 32 \cos^3 \theta + 6 \cos \theta$.
- Sum the series $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \frac{1+3+3^2+3^3}{4!} + \dots$
- Find the Eigen values of the matrix $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \\ 0 & 1 & -2 \end{pmatrix}$.
- A manufacturer, who produces medicine bottles, find that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain: (i) no defective, and (ii) at least two defectives.

Part C

Answer any TWO questions.

(2× 20= 40)

19. (a) Find the angle of intersection of the cardioids $r = a(1 + \cos\theta)$ and $r = b(1 - \cos\theta)$.
(b) Form the differential equation by eliminating the arbitrary constants from
 $z = (x^2 + a)(y^2 + b)$. (14+6)

20. Verify Cayley Hamilton theorem for the Matrix $A = \begin{pmatrix} 1 & 2 & -1 \\ 0 & 3 & 0 \\ 4 & 5 & 2 \end{pmatrix}$. (20)

21. (a) Prove that $\cos^5\theta = \frac{1}{16}[\cos 5\theta + 5\cos 3\theta + 10\cos\theta]$.
(b) Discuss the Maxima and Minima of the function $u(x, y) = x^3y^2(6 - x - y)$. (8+12)

22. (a) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads.

- (b) Calculate 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

(6+14)
