



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

FIRST SEMESTER – NOVEMBER 2017

**MT 1102 - MATHEMATICS FOR CHEMISTRY**

Date: 07-11-2017  
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

**PART-A**

**Answer ALL the questions:**

**(10 x 2=20)**

1. Write the expression of  $\sin n\theta$  in powers of  $\sin\theta$  and  $\cos\theta$ ?
2. Evaluate  $\int \sqrt{1+5x} dx$
3. Write the expansion of  $(1-x)^{-2}$
4. Expand the series  $\log(1+x)$ .
5. Differentiate  $x \sin x$  with respect to  $x$ .
6. State Euler's formula.
7. Define Binomial distribution.
8. Find the constant  $a_0$  of the Fourier series for the function  $f(x) = k, 0 \leq x \leq 2$  .
9. Find the complementary function of  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 5y = 0$ .
10. Define root mean square deviation.

**PART-B**

**Answer any FIVE questions:**

**(5 x 8=40)**

11. Prove that  $\cos 6\theta = 1 - 18\sin^2\theta + 48\sin^4\theta - 32\sin^6\theta$  .
12. Solve  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2e^x$ .
13. Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin^3 x}{\sin^3 x + \cos^3 x} dx$ .
14. Solve  $(y^2 + z^2)p - xyq = -xz$
15. Find the maximum or minimum of the function  $2(x^2 - y^2) - x^4 + y^4$ .

16. An irregular six faced die is thrown and the expectation that in 10 thrown it will give five even numbers is twice the expectation that it will give four even numbers. How many times in 10,000 sets of 10 throws each, would you expect it to give no even number.

17. Find the equation of the tangent to the curve  $y = \frac{x^2}{4-x}$  at the point (2, 2).

18. If  $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$ , show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$ .

**PART-C**

**Answer any TWO questions:**

**(2 x 20=40)**

19. a) Sum the series  $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$

b) Show that  $\log \sqrt{12} = 1 + \left(\frac{1}{2} + \frac{1}{3}\right)\frac{1}{4} + \left(\frac{1}{4} + \frac{1}{5}\right)\frac{1}{4^2} + \dots$  **(12+8)**

20. a). The average salary of male employees in a firm was Rs. 520 and that of females was Rs. 420.

The mean salary of all the employees was Rs. 500. Find the percentage of male and female.

b) Calculate the mean for the following frequency distribution

<i>Class interval</i>	0-8	8-16	16-24	24-32	32-40	40-48
<i>frequency</i>	8	7	16	24	15	7

**(8+12)**

21. Find the eigenvalues and eigenvectors of the matrix  $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$ . **(20)**

22. a) Solve  $(D^2 - 4D + 4)y = e^{2x} + 3$ .

b) Determine the Fourier series expansion of  $f(x) = \frac{1}{2}(f - x)$  in the interval (0,2 ).

**(10+10)**

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