



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

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

FIRST SEMESTER – APRIL 2018

**17/16UMT1AL03- MATHEMATICS FOR CHEMISTRY - I**

Date: 30-04-2018  
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

**SECTION-A**

Answer ALL the questions

(10 x 2 = 20)

1. Find  $\frac{d}{dx}(\log_e(4x+5))$ .
2. Show that  $\frac{d}{dx}(\cosh x) = \sinh x$ .
3. Evaluate  $\int x^5 dx$ .
4. Evaluate  $\int \frac{x dx}{6x^2+5}$ .
5. Prove that  $\cosh^2 x - \sinh^2 x = 1$ .
6. State De Moivre's theorem.
7. State any two properties of normal distribution.
8. Write down the formula to find the probability in Poisson distribution.
9. Write down the series expansion of  $\log_e(1+x)$ , where  $-1 < x < 1$ .
10. Write the Cauchy's root test for the convergence of a series of positive real numbers.

**SECTION-B**

Answer any FIVE questions

(5 x 8=40)

11. Prove that  $\int_0^{\pi/2} \frac{(\sin x)^{3/2}}{(\sin x)^{3/2} + (\cos x)^{3/2}} dx = \frac{\pi}{4}$ .
12. Test the convergence of the series  $\frac{1.2}{3.4.5} + \frac{2.3}{4.5.6} + \frac{3.4}{5.6.7} + \dots$ .
13. Find the maxima and minima of the function  $\frac{\log x}{x}$ , for positive  $x$ .
14. Show that  $\cosh^{-1} x = \log_e(x + \sqrt{x^2 - 1})$ .
15. Show that  $\frac{e+1}{e-1} = \frac{\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \dots}{\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots}$ .
16. Express  $\cos 5\theta$  in terms of  $\cos \theta$ .

17. Find the mean and standard deviation for the following table giving the age distribution of 542 students.

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

18. The ranks of some 16 students in Mathematics and Chemistry are as follows:

Two numbers within brackets denote the ranks of the students in Mathematics and Chemistry.

(1, 1), (2,10), (3,3), (4,4), (5,5), (6,7), (7,2), (8,6),

(9,8), (10,11), (11,15), (12, 9), (13,14), (14,12), (15,16),(16,13).

Calculate the rank correlation coefficient for proficiencies of this group in Mathematics and Chemistry.

### SECTION-C

**Answer Any TWO questions**

**(2 x 20=40)**

19. a) Find the maxima and minima of the function  $f(x) = 2x^3 - 3x^2 - 36x + 10$ .

b) If  $u = \tan^{-1}\left[\frac{x^3+y^3}{x-y}\right]$ , then show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$ . (12+8)

20. a) Evaluate  $\int \frac{(3x+7)}{2x^2+3x-2} dx$ .

b) Show that  $\int_0^{\pi/4} [\log(1 + \tan \theta)] d\theta = \frac{\pi}{8} \log 2$ . (12+8)

21. a) Show that  $1 + \frac{2^4}{2!} + \frac{3^4}{3!} + \frac{4^4}{4!} + \dots = 15e$ .

b) Express  $f(x) = \frac{\pi-x}{2}$  as a Fourier series to be valid in the interval  $(0, 2\pi)$ . (10+10)

22. For the following data,

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

a) Calculate the coefficient of correlation.

b) Obtain the equations of two lines of regression. (10+10)

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