LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2018**

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

Date: 02-11-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part A (Answer ALL questions) **(2 x 10 = 20)**

1. Differentiate the function $y = 4x^2 - 9x - 3$ with respect to x.
2. Find the equation of the tangent to the curve $y = x^3$ at $(1, 2)$.
3. Expand $(1+x)^{-n}$.
4. Write the expansion of $e^x + e^{-x}$.
5. Integrate $\int_0^{\pi/2} \cos^3 x dx$.
6. State Bernoulli's formula.
7. Write the expansion of $\sin\theta$ in terms of θ.
8. Define Fourier series.
9. Write the equation of regression lines.
10. Define Binomial distribution.

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

11. Find the angle of intersection of the curves $r = a(1+\cos\theta)$ and $r = b(1-\cos\theta)$.
12. Differentiate the following functions with respect to x:

    (i) $e^x \sin x \log x$ (ii) $\frac{\sin x}{x}$ (iii) $(2x^2+4)^3$ **(3 + 3 + 2)**

13. Sum the series $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \frac{1+3+3^2+3^3}{4!} + ...\infty$.
14. Show that $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx = \frac{\pi}{4}$.
15. Evaluate $\int x^3 \sin x dx$.
16. Prove that $2^6 \cos^7\theta = \cos 7\theta + 7\cos 5\theta + 21\cos 3\theta + 35\cos\theta$.
17. Express $f(x) = x \ (-\pi < x < \pi)$ as a Fourier series with period 2π.

18. The rank of same 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.

Part C (Answer any TWO questions) **(2 x 20 = 40)**

19. a) Discuss the maxima and minima of the function $x^3y^2(6-x-y)$.

b) Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)}dx$.

(12 + 8)

20. a) Find the sum to infinity of the series $1+\frac{3}{4}+\frac{3.5}{4.8}+\frac{3.5.7}{4.8.12}+....$.

b) Show that $Log\sqrt{12} = 1+\left(\frac{1}{2}+\frac{1}{3}\right)\frac{1}{4}+\left(\frac{1}{4}+\frac{1}{5}\right)\frac{1}{4^2}+\left(\frac{1}{6}+\frac{1}{7}\right)\frac{1}{4^3}+.....$

(8 + 12)

21. a) Express $\frac{\sin 6\theta}{\sin\theta}$ in terms of $\cos\theta$.

b) Expand $\sin^3\theta\cos^5\theta$ in a series of sines of multiples of θ.

(10+10)

22.a) Calculate the 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
Number of members	3	61	132	153	140	51	2

b) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y) .

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

(10+10)

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