LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2016**

16UMT1AL03 – MATHEMATICS FOR CHEMISTRY - I

Date: 09-11-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART – A

Answer ALL questions. (10 × 2 = 20)

1. If $y = (sinx)^x$, then find $\frac{dy}{dx}$.
2. Prove that $cosh^2x - sinh^2x = 1$.
3. Write the formula for subtangent and subnormal in Cartesian form.
4. Using Binomial theorem, find the value of $(101)^4$.
5. Evaluate $\int (2e^x - x^3)\,dx$.
6. State any two properties of definite integrals.
7. Evaluate $\int_0^{\frac{\pi}{2}} \sin^8 x\,dx$.
8. Write the formula for $\tan n\theta$.
9. State any two properties of normal distribution.
10. Write the formula for Binomial distribution.

PART – B

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

11. Sum the series $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \frac{1+3+3^2+3^3}{4!} + \cdots$.
12. Find the maxima and minima of the function $2x^3 - 3x^2 - 36x + 10$.
13. Evaluate $\int \frac{x^2}{x+2}\,dx$.
14. Integrate $\frac{3x+1}{(x-1)^2(x+3)}$ with respect to x.
15. Express $\cos 6\theta$ in terms of $\cos\theta$.
16. Prove that $\sin^5\theta = \frac{1}{16}[\sin 5\theta - 5\sin 3\theta + 10\sin\theta]$.
17. Calculate the standard deviation for the following table (distribution of 542 members).

Age(in yrs)	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
No. of members	3	61	132	153	140	51	2

18. The ranks of some 16 students in Mathematics and Statistics are as follows: two numbers within brackets denote the ranks of the students in Mathematics and Statistics:
(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 Statistics

PART – C

Answer any TWO questions. (2 × 20 = 40)

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

(b) Examine the convergence of the series $\sum_1^{\infty}\left(\frac{n}{n+1}\right)^{\frac{1}{2}} x^n$. (10+10)

20. (a) Discuss the Maxima and Minima of the function $u(x,y) = x^3y^2(6-x-y)$

(b) Test the convergence of the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \frac{7}{4.5.6} \ldots$ (12+8)

21. (a) Prove that $\sin^4\theta\cos^3\theta = \frac{1}{64}[\cos 7\theta - \cos 5\theta - 3\cos 3\theta + 3\cos\theta]$.

(b) Obtain the Fourier series for the function $f(x) = x^2$ in $-\pi < x < \pi$. (10+10)

22. (a) For the following table

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

(i) Calculate the coefficient of correlation.

(ii) Obtain the equation of two lines of regression. Also obtain the estimate of X for $Y = 70$.

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