

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**B.Sc. DEGREE EXAMINATION – CHEMISTRY****FIRST SEMESTER – APRIL 2022****16/17/18UMT1AL03 – MATHEMATICS FOR CHEMISTRY - I**

Date: 28-06-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

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

1. If $y = (\sin x)^x$, then find $\frac{dy}{dx}$.
2. Find the equation of the tangent to the curve $y = x^2$ at (1,2).
3. Using binomial theorem, find the value of $(101)^4$.
4. Write the expansion of $e^x + e^{-x}$.
5. Integrate $\int_0^{\frac{\pi}{2}} \sin^3 x \, dx$.
6. State any two properties of definite integrals.
7. Write the expansion of $\tan \theta$ in terms of θ .
8. Obtain the sine series for unity in $(0, \pi)$.
9. State any two properties of normal distribution.
10. Write the equation of regression lines.

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

11. Find the angle of intersection of the curves $r = a(1 + \cos \theta)$ and $r = b(1 - \cos \theta)$.
12. Sum the series $1 + \frac{1+3}{2!} + \frac{1+3+3^2}{3!} + \frac{1+3+3^2+3^3}{4!} + \dots \infty$.
13. Find the maxima and minima of the function $2x^3 - 15x^2 + 36x + 10$
14. Show that $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} \, dx = \frac{\pi}{4}$.
15. Evaluate $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} \, dx$.
16. Prove that $\sin^5 \theta = \frac{1}{16} [\sin 5\theta - 5\sin 3\theta + 10\sin \theta]$.
17. Obtain the Fourier expansion of $x \sin x$ as a cosine series in $(0, \pi)$.
18. 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

Part C

Answer any TWO questions

(2 × 20 = 20)

19. (a) Discuss the maxima and minima of the function $u(x, y) = x^3y^2(1 - x - y)$.

(b) Evaluate $\int \frac{x^2 - 29x + 5}{(x-4)^2(x^2+3)} dx$. (12+8)

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

(b) Test the convergence of the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \frac{7}{4.5.6} + \dots$. (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) Find the Fourier series to represent x^2 in the interval $(-l, l)$. (10+10)

22. Calculate the correlation coefficient and lines of regression from the following data.

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

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