LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRDSEMESTER – NOVEMBER 2017

MT 3103- MATHEMATICS FOR CHEMISTRY

Date: 11-09-2017 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Section A

Answer ALL questions: **(10 x 2 = 20)**

1. What is the differential coefficient of $cosx$?
2. If $y = e^x + logx$, find $\frac{dy}{dx}$.
3. Integrate $x^{-4} + ax$ with respect to x.
4. Write any two properties of definite integrals.
5. Expand $log\left(\frac{1+x}{1-x}\right)$.
6. Find the characteristic roots of the matrix $A = \begin{pmatrix} 4 & 1 \\ 3 & 2 \end{pmatrix}$.
7. Expand $sinn\theta$ in powers of $\cos\theta$ and $\sin\theta$.
8. Find the real and imaginary parts of $\sin(\theta + i\emptyset)$.
9. What is the chance that a leap year selected at random will contain 53 Sundays?
10. Define the probability mass function of binomial distribution.

Section B

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

11. Find the differential coefficient of $\frac{(a-x)^2(b-x)^3}{(c-2x)^3}$.
12. Find the equation of the tangent to the curve $y = \frac{6x}{x^2-1}$ at the point $(2,4)$.
13. Evaluate $\int \frac{2x+3}{x^2+x+1} dx$.
14. Show that $\int_0^{\pi/2} \frac{(sinx)^{3/2}}{(sinx)^{3/2}+(cosx)^{3/2}} dx = \frac{\pi}{4}$.
15. If *a*,*b*,*c* denote three consecutive integers show that

$$logb = \frac{1}{2}loga + \frac{1}{2}logc + \frac{1}{2ac+1} + \frac{1}{3(2ac+1)^3} + \frac{1}{5(2ac+1)^5} + \cdots\infty$$

16. Find the sum to infinity of the series $1 + \frac{2^3}{2!} + \frac{3^3}{3!} + \cdots$.
17. Prove that$\cos 5\theta = 16\cos^5\theta - 20\cos^3\theta + 5\cos\theta$.
18. A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which (i) neither car is used and (ii) some demand is refused.

Section C

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

19. (a) Find the maxima and minima of the function $2x^3 - 3x^2 - 36x + 10$.
    (b) Differentiate $y = xe^x \cos x$.

(12 + 8)

20. (a) Evaluate $\int \frac{x}{(x-1)(x-2)(x-3)} dx$.
    (b) Find the sum to infinity of the series $\frac{2.4}{3.6} + \frac{2.4.6}{3.6.9} + \frac{2.4.6.8}{3.6.9.12} + \cdots$.

(10+10)

21. (a) If $sin(A + iB) = x + iy$, prove that (i) $\frac{x^2}{cosh^2 B} + \frac{y^2}{sinh^2 B} = 1$ (ii) $\frac{x^2}{sin^2 A} - \frac{y^2}{cos^2 A} = 1$.
    (b) Find the characteristic roots and the characteristic vectors of the matrix
    $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

(8 + 12)

22. (a).Two unbiased dice are thrown. Find the probability that:
    (i) both the dice show the same number
    (ii) the first die shows 6
    (iii) the total of the numbers on the dice is 8
    (iv) the total of the numbers on the dice is greater than 8.
    (b) Calculate the mean and 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
No. of Members	3	61	132	153	140	51	2

(8 + 12)

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