LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – NOVEMBER 2014

MT 1102 – MATHEMATICS FOR CHEMISTRY

Date : Dept. No. Max. : 100 Marks

Time :

SECTION A

ANSWER ALL QUESTIONS. **(10 × 2 = 20)**

1. Differentiate $4x^2 - 9$ with respect to x.
2. . Find the angle which the tangent at (2, 4) to the curve $y = 6 + x - x^2$ makes with the x-axis
3. Evaluate $\int_1^2 \left(x^2 - \frac{1}{x^2}\right) dx$.
4. Integrate $\int \frac{dx}{x^2+a^2}$.
5. Prove that $\frac{e^2-1}{e^2+1} = \frac{\frac{1}{1!}+\frac{1}{3}+\frac{1}{5!}+\ldots\infty}{1+\frac{1}{2!}+\frac{1}{4}+\ldots\infty}$.
6. Prove that $log\frac{n+1}{n} = 2\left[\frac{1}{2n+1} + \frac{1}{3(2n+1)^3} + \frac{1}{5(2n+1)^5} + \cdots\right]$.
7. Prove that $cosh2x = cosh^2x + sinh^2x$
8. Write the expansion of $tan5\theta$.
9. What is the chance that a leap year selected at random will contain 53 Sundays?
10. Two unbiased dice are thrown. Find the probability of getting an even number on the first die.

SECTION B

ANSWER ANY FOUR QUESTIONS. **(5 × 8 = 40)**

11. Find the equation of the tangent to the curve $y = \frac{6x}{x^2-1}$ at the point (2, 4).
12. Evaluate $\int sin^{-1}x dx$.
13. Prove that $\int_0^{\pi/2} \frac{(sinx)^{3/2}}{(sinx)^{3/2}+(cosx)^{3/2}} dx = \frac{\pi}{4}$.
14. Show that $log\sqrt{12} = 1 + \left(\frac{1}{2}+\frac{1}{3}\right)\frac{1}{4} + \left(\frac{1}{4}+\frac{1}{5}\right)\frac{1}{4^2} + \left(\frac{1}{6}+\frac{1}{7}\right)\frac{1}{4^3} + \cdots$.
15. Find the sum to infinity of the series $\frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \cdots \infty$.

16. Expand $sin^4\theta cos^2\theta$ in a series of multiples of cosines of multiples of θ.

17. If $tan(x + iy) = u + iv$, prove that $\frac{u}{v} = \frac{sin2x}{sinh2y}$.

18. State and prove addition theorem of probability.

SECTION C

ANSWER ANY TWO QUESTIONS. **(2 x 20 = 40)**

19. a) Find the angle of intersection of the cardioids $r = a(1 + cos\theta)$ and $r = b(1 - cos\theta)$.

    b) Evaluate $I = \int_0^{\pi/2} logsinxdx.$ **(10 + 10)**

20. a) Solve $\frac{y^2z}{x}p + xzq = y^2$ using Lagrange's method.

    b) Solve $(D^2 + 3D + 2)y = e^{-x} + x^2 + cosx.$ **(10 + 10)**

21. a) Express $f(x) = \frac{1}{2}(\pi - x)$ as a Fourier series with period 2π, to be valid in the interval 0 to2π.

    b) Express $cos6\theta$ in terms of $sin\theta$. **(12 + 8)**

22. a) Calculate 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

b) 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) the proportion of days on which some demand is refused. **(10+10)**

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