LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – NOVEMBER 2011

MT 3103 - MATHEMATICS FOR CHEMISTRY

Date : 09-11-2011 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

Part A. Answer ALL the questions. Each question carries 2 marks. 10 x 2 = 20

1. Find the derivative of $y = \sin^2 2x$ with respect to x.
2. For the cycloid $x = a(1-\cos\theta)$; $y = a(\theta-\cos\theta)$, find $\frac{ds}{dx}$.
3. Evaluate $\int \frac{x}{\sqrt{1-x^2}}dx$
4. Solve $\frac{d^2y}{dx^2}-8\frac{dy}{dx}+15y=0$
5. If $y = x-\frac{x^2}{2}+\frac{x^3}{3}-...$ *prove that* $x = y+\frac{y^2}{2!}+\frac{y^3}{3!}+...$
6. Show that $\sum_{1}^{\infty}\frac{n-1}{n!}=1$
7. If $\frac{Sin\theta}{\theta}=\frac{2165}{2166}$, show that the angle θ is 3^o approximately.
8. Prove that sinh(x + y) = sinhx coshy + coshx sinhy.
9. If the probability of defective bolt is 0.1; find the mean and standard deviation for the distribution of defective bolts in a total of 500.
10. State the significance of normal distribution.

Part-B. Answer any FIVE questions only. Each question carries 8 marks. 5 x 8 = 40

11. Sum the series $1+\frac{1+3}{2!}+\frac{1+3+3^2}{3!}+....\infty$
12. When x is large, prove that $\sqrt[3]{x^3+6}-\sqrt[3]{x^3+3}=\frac{1}{x^2}$
13. Find $\frac{dy}{dx}$ for $y=\sqrt{\sin x+\sqrt{\sin x+\sqrt{\sin x+.....}}}...\infty$
14. Find the angle of intersection of the cardioids r = a(1+cosθ) and r = b(1-cosθ)

15. Prove that $\int_0^{\pi/2} \frac{dx}{5+4\cos x} = \frac{\pi}{6}$

16. Solve $(D^2 - 3D + 2)\, y = e^{4x}$

17. Prove that $2^5\cos^6\theta = \cos 6\theta + 6\cos 4\theta + 15\cos 2\theta + 10$

18. The mean marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean corresponding to the correct score.

Part-C Answer any TWO questions. Each question carries 20 marks. 2x 20 = 40

19. Prove that $\log\sqrt{12} = 1 + \left(\frac{1}{2}+\frac{1}{3}\right)\frac{1}{4} + \left(\frac{1}{4}+\frac{1}{5}\right)\frac{1}{4^2} + \left(\frac{1}{6}+\frac{1}{7}\right)\frac{1}{4^3} + \ldots$

(20)

20. a) Differentiate $e^{\sin^{-1}x}$ with respect to $\sin^{-1}x$

    b) Find the maxima and minima of the function $2x^3 - 3x^2 - 36x + 10$

(8+12)

21. a) If $x = 2\cos\theta$, show that $2(1+\cos 8\theta) = (x^4 - 4x^2 + 2)^2$

    b) Solve $p + q = pq$

(12+8)

22. a)Evaluate $\int x^3 \cos 3x\, dx$

    b) The probability that a student passes a Physics test is $\frac{2}{3}$ and the probability that he passes both Physics test and English test is $\frac{14}{45}$. The probability that he passes atleast one test is $\frac{4}{5}$. What is the probability that he passes the English test?

    (10+10)

****

****