LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRD SEMESTER – **APRIL 2014**

MT 3103 - MATHEMATICS FOR CHEMISTRY

Date : 05/04/2014 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

SECTION-A

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

1. Differentiate $sin^{-1}(\sqrt{x})$.
2. Find $\frac{dy}{dx}$ for x = a(θ+sin θ); y = a(1-cos θ).
3. Evaluate $\int \frac{x^2}{(a+bx)^3} dx$.
4. Evaluate $\int x^2 e^{3x} dx$
5. Define Fourier series.
6. Show that $\cosh^2 x - \sinh^2 x = 1$
7. Write the series expansion of $\log(1+x)$.
8. Expand tan 7θ in terms of tanθ.
9. Define the probability mass function of binomial distribution.
10. Find the arithmetic mean of the following frequency distribution:

x:	1	2	3	4	5	6	7
f:	5	9	12	17	14	10	6

SECTION B

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

11. Prove that the tangents to the curve $y = x^2 - 5x + 6$ at the points (2,0) and (3,0) cut at right angles.
12. Find the maxima and minima of the function $2x^3 - 3x^2 - 36x + 10$.
13. Evaluate $\int x^3 cos2x dx$ using Bernoulli's formula.
14. Solve $(D^2 + 16)y = cos4x$.
15. Sum the series $\frac{1.4}{5.10} - \frac{1.4.7}{5.10.15} + \frac{1.4.7.10}{5.10.15.20} \ldots$
16. Find the real and imaginary parts of $\tan^{-1}(x+iy)$.

17. Solve $p+q=\sin x+\sin y$.

18. A coin is tossed six times. What is the probability of obtaining four or more heads?

SECTION C

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

19. (a) Find the equation of the tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. (10)

(b) Find the point of inflexion on the curve $y=\frac{a^2x}{x^2+a^2}$. (10)

20. (a) Evaluate $\int \frac{6x+5}{\sqrt{6+x-2x^2}}$ (10)

(b) Prove that $\int_0^{\frac{\pi}{4}} log(1+tan\theta)\,d\theta=\frac{\pi}{8}log2$. (10)

21. (a) Sum the series $\frac{1}{1.4.7}+\frac{1}{4.7.10}+\frac{1}{7.10.13}+\cdots$ (10)

(b) Prove that $\frac{sin7\theta}{sin\theta}=64cos^6\theta-80cos^4\theta+24cos^2\theta-1$ (10)

22.(a) Express $f(x)=\frac{(\pi-x)}{2}$ as a Fourier series with period 2π to be valid in the interval 0 to 2π. (10)

(b). A coffee connoisseur claims that he can distinguish between a cup of instant coffee and a cup of percolator coffee 75% of the time. It is agreed that his claim will be accepted if he correctly identifies at least 5 of the 6 cups. Find his chances of having the claim (i) accepted, (ii) rejected, when he does have the ability he claims. (10)

****