LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **APRIL 2016**

MT 4204 - ADVANCED MATHS FOR CHEMISTRY

Date: 27-04-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART A

Answer ALL questions: (10 x 2 = 20)

1. Prove that $\beta(m, n) = \beta(n, m)$.

2. Evaluate $\int_0^{\frac{\pi}{2}} \sin^{10}\theta \, d\theta$.

3. Show that $\vec{A} = 3y^4z^2\vec{i} + 4x^3z^2\vec{j} - 3x^2y^2\vec{k}$ is solenoidal.

4. Find $L^{-1}\left(\frac{1}{s+2}\right)$.

5. Remove the fractional coefficient from the equation $x^3 - \frac{1}{4}x^2 + \frac{1}{3}x - 1 = 0$.

6. Find the equation whose roots are the roots of $x^5 - 6x^4 + 6x^3 + 9x^2 + 2x - 7 = 0$ with signs changed.

7. Write the formula for karl Pearson's coefficient of correlation.

8. Define Regression Coefficients.

9. State Newton's Forward formula

10. Solve by Cramer's rule $x + y = 10$ and $2x - y = 5$.

PART B

Answer ANY FIVE questions (5 X 8 = 40)

11. Express $\int_0^1 x^m(1 - x^n)^p \, dx$ in terms of Gamma functions and evaluate the integral $\int_0^1 x^5(1 - x^3)^{10} \, dx$.

12. Evaluate $\iint(x^2 + y^2) \, dx \, dy$ over the region for which x, y are each ≥ 0 and $x + y \leq 1$.

13. Find $L(t \, e^{-t} \sin t)$.

14. Form an equation which shall have root $3-\sqrt{-2}$.

15. If $a + b + c + d = 0$, show that $\frac{a^5+b^5+c^5+d^5}{5} = \frac{a^2+b^2+c^2+d^2}{2} \cdot \frac{a^3+b^3+c^3+d^3}{3}$.

16. Fit a straight line for the following data.

X	1	2	3	4	5	6	7	8	9	10
Y	52.5	58.7	65	70.2	75.4	81.1	87.2	95.5	102.5	108.4

17. Using Gauss – Seidel method solve the equations $2x + y + z = 4$, $x + 2y + z = 4$
and $x + y + 2z = 4$.

18. Find a root of the equation $x^3 - x - 11 = 0$ correct to three decimals using bisection method.

PART C

Answer ANY TWO questions: (2 X 20 = 40)

19. (a) Evaluate $r\sqrt{a^2 - r^2}\, dr\, d\theta$ over the upper half of the circle $r = a\cos\theta$.

   (b) Prove that $\beta(m.n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (10+10)

20. (a) Find $L^{-1}\left[\frac{1}{(s+1)(s^2+2s+2)}\right]$.

   (b) Using Laplace transformation solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = sint$ given that $y = \frac{dy}{dt} = 0$,

   when $t = 0$. (10+10)

21. (a) Solve the equation $6x^6 - 35x^5 + 56x^4 - 56x^2 - 6 = 0$. (10+10)

   (b) Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ may be in geometric

   progression. Hence solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$.

22. (a) Obtain the equations of two lines of regressions for the following data.

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

   (b) Solve $x^3 + 2x^2 + 10x - 20 = 0$ by Newton – Raphson method. (10+10)

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