Sr.No.14066

Exam Code:210402

Subject Code: 4952

M.Sc. Chemistry - 2nd Semester

(2721)

Paper: Course-XIII Opt(i)

Mathematics for Chemists (For Medical Students)

Time Allowed: 2 hrs. **Max. Marks: 25**

Note: There are EIGHT questions of equal marks. Candidates are required to attempt any FOUR questions.

Section-A

1. (a) Prove that $x + \frac{1}{x} = 2\cos\theta$, then $x^3 + \frac{1}{x^3} = 2\cos 3\theta$.

   (b) Prove that $\begin{vmatrix} x & y & y+z \\ z & x & z+x \\ y & z & x+y \end{vmatrix} = (x+y+z)(x-z)^2$

2. (a) Prove that $(\cos A - \cos B)^2 + (\sin A - \sin B)^2 = 4\sin^2\left(\frac{A-B}{2}\right)$

   (b)Show that $\sin 2x + 2\sin 4x + \sin 6x = 4\cos^2 x \sin 4x$

Section-B

3. (a) Use Cayley Hamilton Theorem to find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

   (b) If $5A - B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix}$, find the matrix A.

4. (a) For what value of x, the matrix $\begin{bmatrix} 3+x & 7 \\ 5-x & 8 \end{bmatrix}$ is a singular matrix.

   (b) Find the Rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$.

Section-C

5. (a) Differentiate $\left(x + \sqrt{x^2 + a^2}\right)^n$ w.r.t x.

   (b) Differentiate $(\sin x)^{\cos x} + (\cos x)^{\sin x}$ w.r.t x.

6. (a) If $x = at^3$ and $y = a(1 + t^2)$, then find $\frac{dy}{dx}$.

   (b) If $y = log\left(x - \sqrt{x^3 - a^3}\right)$ find $\frac{dy}{dx}$.

Section-D

7. (a) Find the reduction formula for $\int cot^n x\, dx$.

   (b) Evaluate $\int sec^4 x \tan x\, dx$.

8. (a) Evaluate the $\int_1^3 (5x^2 + 7x)\, dx$ as limit of a sum.

   (b) Evaluate $\int \frac{(x^2+8)^2}{x^4}\, dx$

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