Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 19

PIT M.Sc (Chemistry) (Sem.-1)

MATHEMATICS

Subject Code : CHL-405M

Paper ID : [51207]

Time : 3 Hrs. Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying FIVE marks each and students have to attempt ALL questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Answer briefly :

1. Find div $\vec{f}$ and curl $\vec{f}$ where $\vec{f} = xy^2\hat{i} + 2x^2yz\hat{j} - 3yz^2\hat{k}$.
2. If $\vec{A} = 3t^2\hat{i} + 2t\hat{j} - t^3\hat{k}, \vec{B} = 5t^2\hat{j} + t\hat{k}$. Find $\vec{A}.\vec{B}$
3. Define Hermitian matrix.
4. Calculate the value of Bohr radius.
5. Evaluate $\int \frac{1}{e^x - 1} dx$
6. If $u = f\left(\frac{y}{x}\right)$, show $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$.
7. Solve $\frac{dy}{dx} + 3x^2y^2 = 0, y(1) = \frac{1}{2}$.
8. If A and B are two events such that

   $P(A) = 0.3, P(B) = 0.4, P(A \cup B) = 0.5$. Find $(A \cap B)$.
9. What are spherical Harmonics of $Y_{11}(\theta, \phi)$.
10. What do you mean by root mean square error?

SECTION-B

11. Show that $i \times (a \times i) + j \times (a \times j) + k \times (a \times k) = 2a$

12. Show that the equations $x + y + z = 6$

$$x + 2y + 3z = 14$$

$$x + 4y + 7z = 30$$

are consistent and solve them.

13. Find the differential equation for bimolecular reaction A + B $\rightarrow$ C where a and b are original concentrations of A and B respectively. Also solve the differential equation.

14. Solve $\int \frac{x}{(x+2)(3-2x)} dx$

15. Find the Fourier series expression for $f(x) = x^3 \, for - \pi < x < \pi$

16. How many diagonals are there in a polygon of n sides?

SECTION-C

17. Find eigen value and eigen vector of $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

18. State and prove Baye's theorem.

19. Trace the curve $y^2 (2a - x) = x^3$.