M.Sc.(Chemistry) (2018 & onwards) (Sem.–1)
# NUMERICAL METHODS FOR CHEMISTS
Subject Code : CHL406B-18
M.Code : 75119

Time : 3 Hrs.   Max. Marks : 50

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION-B contains EIGHT questions carrying FOUR marks each and students have to attempt any SIX questions.**
3. **SECTION-C will comprise of two compulsory questions with internal choice in both these questions. Each question carries EIGHT marks.**

SECTION-A

1. Define Eigen values and Non-singular matrices.

2. Explain the use of differential calculus in thermodynamics.

3. Find derivative of $x^2 + \dfrac{\pi}{2} - \sqrt{x}$.

4. Define Exact and Linear differential equation.

5. In how many ways can 5 persons draw water from 5 taps, assuming no tap remains unused?

SECTION-B

6. Find inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$.

7. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find values of *x, y, z* and *w*.

8. Evaluate $\lim_{x \to 2} \dfrac{x^2 - 3x + 2}{x - 2}$.

9. Evaluate $\int e^x \sin x \, dx$.

10. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = x^2$.

11. Solve $(D^2 + 2D + 2)y = x^2$

12. Find how many arrangements can be made with the letters of the word 'MATHEMATICS'? In how many of them (a) consonants occur together (b) vowels occur together.

13. The probability that boys will Pass an examination is $\dfrac{3}{5}$. And that for girls is $\dfrac{2}{5}$. What is the probability that atleast one of them will pass the examination?

SECTION-C

14. Determine the eigen values and eigen vectors of the matrix A $= \begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix}$. Is it diagonalizable? Justify?

Or

Find $\int \dfrac{x-1}{(x-2)(x-3)} dx$.

15. Solve $(x^2 - y^2) \, dx + 2xy \, dy = 0$

Or

Fit a straight line to the following data regarding X as independent variable :

X	1	2	3	4	5
Y	5	7	9	10	11

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.