

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 02

Total No. of Questions : 15

M.Sc.(Chemistry) (2018 Batch) (Sem.-1)
NUMERICAL METHODS FOR CHEMISTS
Subject Code : CHL406B-18
Paper ID : [75119]

Time : 3 Hrs.

Max. Marks : 50

INSTRUCTION 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) Illustrate the associative law of matrix multiplication using an example.
- 2) Prove that any square matrix can be expressed as a sum of symmetric and skew-symmetric matrix.
- 3) Define Bohr's radius.
- 4) How are differential equations applicable in chemical kinetics?
- 5) Explain Conditional probability with example.

SECTION-B

- 6) Express $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrix.

- 7) Obtain the inverse of the following Matrix :

$$A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

- 8) Prove that the function $f(x) = 5x - 3$ is continuous at $x = 0$, at $x = -3$ and at $x = 5$.
- 9) Find the derivative of f given by $f(x) = \sin^{-1} x$ assuming it exists.
- 10) Find the general solution of the differential equation $dy/dx - y = \cos x$
- 11) Show that the differential equation $(x-y) dy - (x+y) dx = 0$ is homogeneous and solve it.
- 12) An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?
- 13) A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

SECTION-C

14) a) Show that
$$\begin{vmatrix} a & b & c \\ a+2x & b+2y & c+2z \\ x & y & z \end{vmatrix} = 0$$

OR

- b) Find the area bounded by the curves $y = \cos x$ between $x = 0$ and $x = 2\pi$
- 15) a) Find the general solution of the differential equation $dy/dx = (1 + y^2) / (1 + x^2)$

OR

- b) Use method of least squares to fit a straight line to the data :

X:	2	4	6	8	10	12
Y:	7.32	8.24	9.20	10.19	11.01	12.05