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

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. 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 $\Delta = \begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix} = 0.$

Or

b) Find the area of the region enclosed between the two circles $x^2 + y^2 = 4$ and $(x - 2)^2 + y^2 = 4$

15. a) Find the general solution of the differential equation $dy/dx = (x + 1)/(2 - y)$, $(y \neq 2)$.

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

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.