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

Total No. of Questions : 19

M.Sc. (Chemistry) (Campus) (2015 to 2017)   (Sem.-1)
MATHEMATICS
Subject Code : CHL-405M
M.Code : 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. Let $u = 2i - j + k$ and $w = i + 2k$ are two vectors' find the cross product $v \times w$ and dot product $u.w$.

2. Find the gradient of scalar point function $\phi(x, y, z) = x^2 yz$ at the point $(1, -1, 2)$

3. Find X and Y if $X + Y = \begin{bmatrix} 1 & 3 \\ 2 & -4 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 10 & -3 \\ 5 & 4 \end{bmatrix}$.

4. Define a Hermitian matrix.

5. Find $\dfrac{dy}{dx}$ where $y = 2\cos\sqrt{x}$.

6. Evaluate the integral $\int (x^5 + 1)^7 x^4 dx$.

7. Solve the differential equation $\dfrac{dy}{dx} = (1 + x^2)(y - 1)$.

8. Write down the differential equation of a harmonic oscillator.

9. Find the probability of outcome 10 from two throws of a dice.

10. In how many ways a committee consisting of 3 men and 2 men can be chosen from 7 men and 5 women?

SECTION-B

11. If $i + j + k$, $2i + 5j$, $3i + 2j - 3k$ and $i - 6j - k$ are the position vectors of points A, B, C and D respectively, then find the angle between $\overrightarrow{AB}$ and $\overrightarrow{CD}$.

12. Solve the following system of equations using matrix method.

    $2x - 3y + 4z = 8, y - 3z = -7, x + 2y + 2z = 11$

13. Find local maximum and minimum values of the function $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$.

14. Find the general solution of the following differential equation :

    $(x^2 + y^2 + x)\, dx + 2xy\, dy = 0$

15. Fit least square straight line to the following data points :

X :	1	2	3	4	5	6
Y :	6	4	3	5	4	2

16. Find the product of AB where $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 4 & 2 \\ 10 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$

SECTION-C

17. Solve the Huckel Molecular – orbital problem for the allyl radical

    CH_2CHCH_2 in terms of the Huckel parameters α and β :

    $(\alpha - E)\, c_1 + \beta c_2 = 0$

    $\beta c_1 + (\alpha - E)\, c_2 + \beta c_3 = 0$

    $\beta c_2 + (\alpha - E) c_3 = 0$

18. Find the Fourier series for $f(x) = x + x^2$, $-\pi \le x \le \pi$.

19. Evaluate the integral $\int \dfrac{dx}{(x+1)^2 (x-2)}$ by resolving into partial fractions.

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.