

**M. SC. CHEMISTRY / M. SC.
ANALYTICAL CHEMISTRY
(MSCCHEM / MSCANCHEM)
Term-End Examination**

June, 2026

MCH-014 : MATHEMATICS FOR CHEMISTS

Time : 1 Hours

Maximum Marks : 25

Note : Attempt any *five* questions. Usual notations are used. Use of calculators is not allowed.

1. (a) Plot the graph of the cosine function for the domain of $x = [0, 2\pi]$. 4
- (b) Which of the following sets is finite : 1
 - (i) $[0, 1]$
 - (ii) $\{1, 2, 3, \dots, 100\}$

2. (a) A living cell divides into two cells in a finite time interval, t . After how long will it have subdivided into 256 cells ? 2
- (b) Calculate the work done by the force, $\vec{F} = 5i + 2j + 3k$, when it is applied to move an object from a point A (1, -2, -2) to another point B (3, 1, 1). 3

3. (a) Evaluate the following expression : 2

$$\lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x^2 + x - 2}$$

- (b) Find the general solution of the following differential equation : 3

$$\frac{dy}{dx} - \frac{3y}{x+1} = (x+1)^4$$

4. Find out the equation of normal and the equation of tangent to the following curve :

3+2

$$y = \frac{(x-5)}{(x-2)(x-3)};$$

where the curve cuts the X-axis.

5. (a) Evaluate any *one* of the following integrals : 2

(i) $\int \frac{(\ln x)^2}{x} dx$

(ii) $\int_{-5}^5 (x^3 + x) dx$

- (b) (i) Calculate A^2 for the following matrix : 3

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

Or

- (ii) Verify that the following matrix A is orthogonal : 3

$$A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$$

6. (a) A number is chosen at random from the first 21 natural numbers. Calculate the probability that the selected number is divisible by 2 or 3. 3

- (b) Define any *one* distribution among Normal, Binomial and Poisson and the limit of random variable, x involved in it. 2
7. In the titration of HCl against NaOH the titrate values were : 9.7 cm³, 9.9 cm³, 10.1 cm³ and 10.3 cm³. Calculate the following : 2+1+1+1
- (a) Standard deviation
- (b) Standard deviation of mean
- (c) Variance
- (d) The coefficient of variance in ppm

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