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May-2026

B.Sc. (Chemistry) - II SEMESTER

Mathematics-II (BCHT-MD-205)

Time: 3 Hours

Max. Marks:75

Instructions:

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Find the transpose of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ -4 & -5 & -6 \end{bmatrix}$. (1.5)

(b) Determine whether the matrix $\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$ is symmetric or skew-symmetric. (1.5)

(c) Define domain of a function. (1.5)

(d) Find the minor of element a_{11} in $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 1 & 0 & 6 \end{bmatrix}$. (1.5)

(e) Find the rank of the matrix $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$. (1.5)

(f) If $U = \{1,2,3,4,5\}, A = \{1,2,3\}$, find complement of A. (1.5)

(g) Find $A \cup B$ and $A \cap B$ if $A = \{1,2,3\}, B = \{2,3,4\}$. (1.5)

(h) Find the value of the function $f(x) = x^2 + 1$ at $x = 2$. (1.5)

(i) Define a relation. (1.5)

(j) Evaluate the determinant: $\begin{vmatrix} 1 & 2 & -1 \\ 3 & 2 & 1 \\ 1 & -3 & 2 \end{vmatrix}$. (1.5)

PART -B

Q2 (a) Perform matrix multiplication:

$A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 2 & 0 \\ -1 & -2 \end{bmatrix}$ (8)

(b) Find the inverse of the matrix: $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 2 & 1 & 1 \end{bmatrix}$. (7)

Q3 (a) Find the area of the triangle with vertices $A(1,2), B(4,6)$ and $C(6,3)$ using determinant method. (8)

(b) Find adjoint of the matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 2 & -3 & 1 \\ 3 & 1 & -2 \end{bmatrix}$. (7)

Q4 (a) Find the rank of the matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 1 & 1 \end{bmatrix}$. (8)

(b) Solve the system of equations: (7)

$$x + y + z = 6,$$

$$2x + 3y + z = 10$$

$$x + 2y + 3z = 13$$

Q5 (a) If $A = \{3,4,5,6,7\}, B = \{-1,2,3,4\}$, then find:

(i) $A - B$ (ii) $B - A$ (iii) $A \cup B$ (iv) $A \cap B$. (8)

(b) If $A = \{4,5,6\}, B = \{1,2,3\}$, then find: $A \times B$. (7)

Q6 (a) Let $A = \{1,2,3,4,5\}$. Write all ordered pairs of relation $R = \{(x,y) : x < y\}$. (8)

(b) If $f(x) = x^2$ and $g(x) = x + 1$, then find:

(i) $(f + g)(x)$ (ii) $(f - g)(x)$ (iii) $(f.g)(x)$ (iv) $\frac{f}{g}(x)$ (7)

Q7 (a) Find the domain and range of the functions: (8)

(i) $f(x) = \sqrt{x-1}$ (ii) $g(x) = \frac{1}{x^2-4}$

(b) Evaluate the greatest integer function:

(i) [2.7], (ii) [−1.3], (iii) [5] (7)