Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 07

B.Sc. (Cyber Security) (Sem.–1)

MATHEMATICS

Subject Code : UGCA1901

M.Code : 92569

Date of Examination : 14-01-23

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.**

SECTION-A

1. Write briefly :

a) Is the set A = $\{x\ x^3 = 8$ and $2x + 3 = 0\}$ empty. Justify

b) If a set A is of rational numbers and B = $\{x : x^2 - 4x + 2 = 0\}$ then find A $\cap$ B, A–B and B–A.

c) Write the truth table for $(p \wedge q) \rightarrow (p \vee q)$.

d) Show that $(p \vee q)$ A $(\sim p \wedge \sim q)$ is a contradiction.

e) Construct a 2 × 2 matrix, A= $[a_{ij}]$ where elements are given by $aij = \frac{(i+j)^2}{2}$.

f) If $\begin{bmatrix} x+3 & 4 \\ y-4 & = y \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 3 & 9 \end{bmatrix}$ find the value of x and y.

g) Find the 10th term of the series 12+10+8+……

h) For what value of x the numbers $\frac{-2}{7}, x, \frac{-7}{2}$ are in G.P.

i) Insert the three G.M. between numbers 1 and 256.

j) Sum the series to infinity: $(\sqrt{2}+1)+1+\sqrt{2}-1)+.....$

SECTION-B

2. a) If A, B, C are any sets, prove that

   i) $A-(B\cup C)=(A-B)\cap(A-C)$

   ii) $A-(B\cap C)=(A-B)\cup(A-C)$

   b) Prove that $A^c-B^c=B-A$ where A and B are sets.

3. a) Out of 400 boys of a school, 112 played cricket, 120 played hockey and 168 played football. Of these 32 played football and hockey, 40 played cricket and football and 20 played cricket and hockey, 12 played all the three games. Find how many boys did not play any game and how many play only one game?

   b) Prove that $p\rightarrow(\sim q\vee r)\equiv(p\wedge q)\rightarrow r$

4. a) Test the validity of the argument: If he works hard then he will be successful. If he is successful then he will be happy. Therefore, hard work leads to happiness.

   b) Show that $p\rightarrow(p\vee q)$ is a tautology.

5. a) Find the product matrix BA where $A=\begin{bmatrix}-2 & 2 & 1\\ 2 & 1 & 1\\ 1 & 2 & 6\end{bmatrix}$ $B=\begin{bmatrix}3 & 2 & 1\\ 5 & 1 & 2\\ 1 & -2 & 1\end{bmatrix}$

   b) If $A=\begin{bmatrix}5 & 2\\ -1 & 2\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ Show that $(A-3I)(A-4I)=0$

6. a) Express $A=\begin{bmatrix}1 & -2 & 3\\ 7 & 0 & 5\\ -4 & 1 & 9\end{bmatrix}$ as a sum of symmetric and skew-symmetric matrices.

b) Find the values x, y, z if the matrix $A=\begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ obey the law $A' A = 1$

7. a) How many terms of the G.P. $3, 3^2, 3^3$ are needed to give the sum equal to 120?

b) If the p^{th} term of an A.P. is a q^{th} term is b. Show that sum of $(p + q)^{th}$ term is $\frac{p+q}{2}\left[a+b+\frac{a-b}{p-q}\right]$.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.