Enrollment No: _____   Exam Seat No:_____

C. U. SHAH UNIVERSITY
Winter Examination-2022

Subject Name: Mathematical Concepts for Computer Science

Subject Code: 4CS01IFM2   **Branch: B.Sc.I.T.**

Semester: 1   **Date: 03/01/2023**   **Time: 11:00 To 02:00**   **Marks: 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1   Attempt the following questions: **(14)**

a) If $A = \{0,2,4,6,7,8\}$ then $|A| = $ _____.
   a) 1   b) 3   c) 6   d) 7

b) Which of the following matrix is of order 2×3?

   (a) $\begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 & 2 \\ 3 & 4 & 5 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 1 \\ 2 & 3 \\ 4 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 & 2 \end{bmatrix}$

c) If $A = \{1,2,3\}$ and $B = \{2,3,5\}$ then $A \cup B = $ _____.
   a) ϕ b) $\{2,3\}$ c) $\{1,2,3,4,5\}$ d) $\{1,2,3,5\}$

d) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$ then $A + B = $ _____.

   a) $\begin{bmatrix} 0 & 2 \\ 3 & 0 \end{bmatrix}$ b) $2\begin{bmatrix} 0 & 2 \\ 3 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ d) $\begin{bmatrix} -1 & 4 \\ 9 & -16 \end{bmatrix}$

e) If $(a,b), (c,d)$ and (a,b) are colinear then the area of triangular formed by these three points is_____
   a) Always positive   b) Always zero   c) May be positive   d) None

f) Consider the matrix $A = \begin{bmatrix} 3 & 0 \\ 8 & 27 \end{bmatrix}$ then the cofactor of $3 = $_____.
   a) -27   b) -9   c) 27   d) 9

g) $\lim_{x \to 2} 6(4x - 2) = $ _____.
   a) 26   b) 36   c) 16   d) 56

h) $\lim_{x \to 0} \dfrac{\sin x}{x} = $ _____
   a) 0   b) 1   c) 2   d) ∞

i) Relation $R = \{(a,a),(b,c),(c,b)\}$ is _____ on $A = \{a,b,c\}$.
   a) symmetric   b) reflexive   c) transitive   d) all of these

j) True or False: The product of two odd function is odd function.
k) Write all improper subsets of $A = \{1,2\}$.
l) Define : Disjoint Sets
m) Define: one-one function.
n) Let $A = \{0,1,2,3\}$, $B = \{1,2,3,4\}$ then find $B - A$.

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**   **(14)**

A   If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$,then find X such that $X = A^2 - 4A - 5I$.   **05**

B   For matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 1 & 1 & 0 \\ -1 & 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & -1 \\ 2 & 2 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & -1 \\ 1 & 1 & 1 \end{bmatrix}$ **05**
Then Check that $AB = AC$.

C   Define the following terms with examples: **04**
i) Skew-Symmetric matrix   ii). Upper triangular matrix

Q-3   **Attempt all questions**   **(14)**

A   Define Reflexive, Anti-symmetric and Transitive Relation.   **05**

B   Let $A = \{1,2,3\}$ and $B = \{u, v\}$. The relation   **05**
$R_1 = \{(1, u), (2, u), (2, v), (3, u)\}$ and $R_2 = \{(1, v), (3, u), (3, v)\}$ then find $R_1 \cup R_2, R_1 \cap R_2, R_1 - R_2, R_2 - R_1$.

C   Check whether the relation R on a set A is Equivalence or not?   **04**
$A = \{1,2,3,4\}$, $R = \{(1,1), (1,2), (2,2), (2,1), (3,3), (3,4), (4,3), (4,4)\}$

Q-4   **Attempt all questions**   **(14)**

A   Draw a Venn Diagram for the following sets: **05**
$U = \{1,2,3, \dots 12\}, A = \{1,2,6,12\}, B = \{1,6,8\}$, $C = \{1,2,3,6\}$

B   Let $A = \{1,2,6,9,13\}, B = \{1,3,6,11,14,15\}, C = \{1,2,3,6,9,10,12,14\}$ **05**
then verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

C   Define the following terms with examples: **04**
i) Equivalent Sets   ii). Subset

Q-5   **Attempt all questions**   **(14)**

A   Draw a graph of a function $f: \text{R} \to \text{R}$ defind by $f(x) = |x|, x \in \text{R}$.   **04**

B   Check whether the function $f: \mathbf{R} \to \mathbf{R}$ is even, odd, or neither even nor odd?   **06**
     i) $f(x) = \cos x$
     ii) $f(x) = x^3$
     iii) $f(x) = x^2 - 9x - 5$

C   Define the following terms with examples: **04**
i) Bijective function   ii). Even function

Q-6	**Attempt all questions**	**(14)**

A	Find the coordinate which divide the line segment joining to the point	**05**
$A(1,2) and B(4,5)$ into the ratio $1:2$ internally.

B	Find the area of the triangle formed by the points:	**05**
$i)$ $(2,3), (5,8), (7,4)$ $ii). (1,0), (4,2), (3,-5)$

C	Find distance between two points:	**04**
$i). (5,5) and (13,5)$ $ii). (6,8) and (6,10)$

Q-7	**Attempt all questions**	**(14)**

A	Find: 1) $lim_{x \to 5} 3(9 + 2x)$ 2) $lim_{x \to 8} \frac{x-7}{x+5}$	**05**

3) $\lim_{x \to 0}(4x^2 + 5x - 6)(7x + 2)$ 4) $\lim_{x \to 0}(x + 1)^{\frac{1}{x}}$

B	Find the equation of straight line passing through the points A $(2, 6)$ and	**05**
B $(1, 2)$ and also find its slope.

C	Evaluate: $\lim_{x \to 2} \dfrac{x^4 - 16}{x^3 - 8}$	**04**

Q-8	**Attempt all questions**	**(14)**

A	Let $A = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then find A^3.	**07**

B	Verify De-Morgan's Law for the following sets:	**07**
$U = \{1,2,3, \dots ,8\}, A = \{2,3,5,7,8\} \ and \ B = \{1,3,5,7,8\}$