Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Winter Examination-2020

Subject Name : Mathematical Concepts for Computer Science

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

Semester: 1 **Date: 12/03/2021** **Time: 03:00 To 06:00** **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) Define : Disjoint Sets **(01)**

b) Give one example of infinite set. **(01)**

c) Let $A = \{0,1,2,3\}, B = \{1,2,3,4\}$ then find $B - A$. **(01)**

d) Let $A = \begin{bmatrix} 0 & 4 \\ -8 & 7 \end{bmatrix}$, then $det\ A$ =_____ **(01)**

e) Write all improper subsets of $A = \{1,2\}$. **(01)**

f) What is the cardinality of a set $\{1,3,5,100\}$? **(01)**

g) $$\lim_{x \to 0} \frac{sinx}{x} = \_\_\_\_\_$$ **(01)**

h) If $(a, b), (c, -d)$ and $(-a, b)$ are colinear then what can we say about the area of triangular formed by these three points? **(01)**

i) Define: one-one function. **(01)**

j) Let $A = \begin{bmatrix} -1 & 0 \\ 9 & 4 \end{bmatrix}$, find minor of the element '4'. **(01)**

k) Check whether the function $f: \mathbf{R} \to \mathbf{R}$ defined by $f(x) = x^3$is even or odd ? **(01)**

l) True or False: The product of two odd function is odd function. **(01)**

m) Let A and B be two sets, let $|A| = 5, |B| = 3$ and $|A \cup B| = 5$ then find $|A \cap B|$. **(01)**

n) $$\lim_{x \to 0} \sin x = \_\_\_\_\_$$ **(01)**

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 prove that $A^2 - 4A - 5I = 0$. **(06)**

b) Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 5 & 0 \end{bmatrix}$ then find a matrix X where $X = -(A + B)$. **(04)**

c) Find $4AB$ where $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$. **(04)**

Q-3 **Attempt all questions** **[14]**

a) Draw a Venn Diagram for the following sets: **(05)**

$$U = \{x \in \boldsymbol{N} : 1 \leq x < 15\}$$

$A = \{1,2,6,9,13\}, B = \{1,3,6,11,14,15\}, C = \{1,2,3,6,9,10,12,14\}$

b) Verify Distributive Law of Intersection over Union for these following sets.$A = \{1,2,6,9,13\}, B = \{1,3,6,11,14,15\}, C = \{1,2,3,6,9,10,12,14\}$ **(05)**

c) Define Proper subset and Finite set with example. **(04)**

Q-4 **Attempt all questions** **[14]**

a) 1) Check whether the following functions $f: R \to R$ are one-one or not? **(06)**

i) $f(x) = x - 1$

ii) $f(x) = x^2$

2) Check whether the following functions $f: R \to R$ are onto or not?

i) $f(x) = x^2 - 4$

ii) $f(x) = x + 1$

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

c) Check whether the function $f: \mathbf{R} \to \mathbf{R}$is even, odd, neither even nor odd? **(04)**

i) $f(x) = \sin x$

ii) $f(x) = x^3$

iii) $f(x) = x^2 + 5x - 1$

Q-5 **Attempt all questions** **[14]**

a) 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 $C = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & -1 \\ 1 & 1 & 1 \end{bmatrix}$ **(06)**

Show that $AB = AC$.

b) Define Reflexive ,Anti-symmetric and Transitive Relation. **(05)**

c) Check whether the relation R on a set A is reflexive or transitive? **(03)**

$A = \{1,2,3,4\}, R = \{(1,1),(1,2),(2,2),(2,1),(3,3),(3,4),(4,3),(4,4)\}$

Q-6 **Attempt all questions** **[14]**

a) In which ratio does the point $(7,3)$ divide the line segement joining the points $P(4,-3)$ and $Q(8,5)$? **(05)**

b) Find the area of triangle made by following points: **(05)**

i) $(8,12),(11,8),(6,8)$

ii) $(5,-1),(4,-5),(5,-4)$

c) Find the value of k if the points $(-6,9),(3,-3)$ *and* $(12,k)$ are collinear. **(04)**

Q-7 **Attempt all questions** **[14]**

a) Let $A = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 1 & -1 \\ 5 & 0 & 1 \end{bmatrix}$, find A^{-1} if possible. **(06)**

b) Find 1) $\lim_{x\to 5} 3(9x+2)$ **(04)**

2) $\lim_{x\to 8} \frac{x+7}{x-5}$

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

4) $\lim_{x\to 0}(x+1)^{\frac{1}{x}}$

c) Verify $(A \cup B)^c = A^c \cap B^c$ for the following sets: **(04)**

$U = \{1,2,\ldots,18\}, A = \{1,2,4,8,16,17\}$ *and* $B = \{5,4,14,16,17,18\}$

Q-8 **Attempt all questions** **[14]**

a) Let $A = \{x \in \boldsymbol{N} \,/\, 2 < x < 8\}$, $B = \{x \in \boldsymbol{Z} \,/\, -1 \leq x \leq 6\}$ then find **(05)**
$A \cup B, A \cap B, A - B$ and $B - A$.

b) **(05)**
Find $adj\ A$ if $A = \begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 4 \\ 1 & 1 & 2 \end{bmatrix}$.

c) Find distance between two points: **(04)**

i) Distance between (0,0) and (36,15)

ii) Distance between (a,b) and (-a,-b)