Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Winter Examination-2019

Subject Name : Mathematical Concepts for Computer Science

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

Semester : 1 **Date : 21/11/2019** **Time : 02:30 To 05:30** **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 : Empty set **(01)**

b) What is the cardinality of a set {1,3,7,9,11,14} ? **(01)**

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

d) Check whether the function $f: \mathbf{R} \to \mathbf{R}$ defined by $f(x) = x^2$ is even or odd ? **(01)**

e) Let A and B be two sets, let $|A| = 5, |B| = 3$ and $|A \cap B| = 2$ then find $|A \cup B|$. **(01)**

f) Define : Increasing function **(01)**

g) Let $A = \{6,8,11\}, B = \{2,3,8,11\}$ then find $A \cup B$. **(01)**

h) Let $A = \begin{bmatrix} 7 & 4 \\ 6 & 9 \end{bmatrix}$, find minor of the element '6'. **(01)**

i) $\lim_{x \to 0} cosx =$ _____ **(01)**

j) $\lim_{x \to 0} \frac{sin3x}{x} =$ _____ **(01)**

k) What do you mean by $x \to \infty$? **(01)**

l) Define : Lower Triangular Matrix **(01)**

m) Give example of one-one function. **(01)**

n) Let $A = \begin{bmatrix} 3 & 4 \\ 8 & -3 \end{bmatrix}$, then tr A =_____ **(01)**

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

Q-2 **Attempt all questions** **[14]**

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

b) Verify $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ for the following sets: **(04)**
$A = \{1,2, \ldots ,10\}, B = \{6,8,2,10\}, C = \{2,3,8,10,11\}$

c) Verify De-Morgan's Law for the following sets: **(04)**
$U = \{1,2, \ldots ,15\}, A = \{1,2,3,8,14,15\}$ and $B = \{4,8,10,14\}$

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

a) Check whether the function $f: \mathbf{R} \to \mathbf{R}$ is even , odd, neither even nor odd? **(06)**

i) $f(x) = |x + 4|$

ii) $f(x) = |x| + 4$

iii) $f(x) = x^3 + 4x$

b) Draw a graph of a function $f: \mathbf{R} \to \mathbf{R}$ defind by $f(x) = |x| \ , x \in \mathbf{R}$ **(05)**

c) Define the following terms with examples: **(03)**

i) Onto function

ii) Decreasing function

iii) One-one function

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

a) Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 6 & 1 & 3 \\ 8 & -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 & 1 \\ 1 & -1 & 3 \\ 1 & -1 & 2 \end{bmatrix}$,then find $2AB$. **(07)**

b) Show that the given relation R is an Equivalence relation on a set A. **(04)**

$A = \{1,2,3,4\}$

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

c) Check whether the relation is reflexive or symmetric ? **(03)**

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

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

a) Let $A = \begin{bmatrix} cos\theta & 0 & sin\theta \\ 0 & 1 & 0 \\ -sin\theta & 0 & cos\theta \end{bmatrix}$ then show that A is an orthogonal matrix. **(07)**

b) Let $A = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then prove that $A^2 = 3A - 2I$. **(05)**

c) Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 6 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$ then find $3A - B$. **(02)**

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

a) Let $A = \{x \in \boldsymbol{N} \ / \ 3 \leq x < 13\}$, $B = \{x \in \boldsymbol{N} \ / \ 2 < x \leq 6\}$ then find $A \cup B, A \cap B, A - B$ and $B - A$. **(05)**

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

$U = \{x \in \boldsymbol{N} \ / \ 1 \leq x \leq 14\}$

, $A = \{1,2,6,9,13,14\}, B = \{2,3,4,5,6,14\}$, $C = \{1,2,4,6,12,14\}$

c) Define the following terms with examples: **(04)**

i) Disjoint sets

ii) Singleton sets

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

a) In which ratio does the point $(-1,6)$ divide the line segement joining the points $P(-3,10)$ and $(6,-8)$? **(07)**

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

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

ii) Distance between (-5,7) and (-1,3)

c) Find the value of k if the points $(8,1), (k,-4)$ and $(2,-5)$ are collinear. **(03)**

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

a) Let $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 6 & 2 \\ 3 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 3 \\ 1 & -3 & 8 \\ 0 & 2 & 7 \end{bmatrix}$,then find $A^2 + 5B + I$, where I is an identity matrix. **(06)**

b) Find the area of triangle made by following points: **(04)**

i) $(1,-1), (4,6), (-3,-5)$

ii) $(-5,-1), (3,-5), (5,2)$

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

2) $\lim_{x\to 2} \frac{3x+1}{x+2}$

3) $\lim_{x\to 0}(x^2+9x+2)(3x-2)$

4) $\lim_{x\to 0} \frac{e^x-1}{x}$