Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Summer Examination-2020

Subject Name : Mathematical Concepts for Computer Science

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

Semester : 1 **Date : 02/03/2020** **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 : Increasing function **(01)**

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

c) What is the cardinality of a set $\{1,3,7,14,1000\}$? **(01)**

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

e) Let $A = \{1,8,11\}, B = \{2,9,11\}$ then find $A \cap B$. **(01)**

f) Define : Disjoint sets **(01)**

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

h) Give an example of odd function. **(01)**

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

j) Let $A = \begin{bmatrix} 5 & 0 \\ 9 & 4 \end{bmatrix}$, 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) What do you mean by $x \to 0$? **(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) $\lim_{x \to 0} cosx = \_\_\_\_\_$ **(01)**

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

Q-2 **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. **(06)**

b) Let $A = \{x \in \boldsymbol{N} / 3 \leq x < 10\}, B = \{x \in \boldsymbol{Z} / -2 < x \leq 4\}$ then find $A \cup B, A \cap B, A - B$ and $B - A$. **(05)**

c) Let $A = \begin{bmatrix} 1 & 2 & -1 \\ 6 & 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 5 & 1 \\ 4 & 2 & 6 \end{bmatrix}$ then find $A + 4B - I$, where I is an identity matix. **(03)**

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

a) 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)**

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

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

$A = \{1,2,6,9,13\}, B = \{2,4,5,6,9,10,12\}, C = \{1,2,3,6,9,10,12\}$

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

i) Equal Sets

ii) Singleton Set

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

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

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

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

iii) $f(x) = x^3 - 9x - 5$

b) Draw a graph of a function $f: \mathbf{R} \to \mathbf{R}$ defind by $f(x) = 4x^2, x \in \mathbf{R}$. **(04)**

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

i) Constant function

ii) Decreasing function

iii) Even function

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

a) Let $A = \begin{bmatrix} 4 & 2 & 3 \\ -1 & 0 & 2 \\ 1 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 3 \\ 2 & 3 & 6 \\ 0 & 2 & 7 \end{bmatrix}$,then find **(06)**

$A^2 - 4B + I$, where I is an identity matrix.

b) Find distance between two points: **(05)**

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

ii) Distance between (-5,0) and (0,3)

c) Find 1) $\lim_{x \to 2} 5(4x - 2)$ **(03)**

2) $\lim_{x \to 5} \frac{x-11}{x+5}$

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

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

a) In which ratio does the point $(-1,6)$ divide the line segement joining the points $P(-3,10)$ and $Q(6,-8)$? **(05)**

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

i) $(1,0), (4,2), (3,-5)$

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 $A = \begin{bmatrix} 4 & 1 & 2 \\ 6 & 1 & 0 \\ 0 & 3 & 2 \end{bmatrix}$, 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)**
$A = \{1,2,\ldots,14\}, B = \{1,2,13,14\}, C = \{2,3,7,9,11,13\}$

c) Verify De-Morgan's Law 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 $A = \begin{bmatrix} 4 & 2 & -12 \\ 0 & 4 & 3 \\ 6 & -1 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 & 1 \\ 0 & -1 & 7 \\ 1 & 1 & 2 \end{bmatrix}$, then find $8AB$. **(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 R on a set A is reflexive or transitive? **(03)**
$A = \{1,2,3,4\}, R = \{(1,1),(1,2),(2,2),(2,1),(3,3),(3,4),(4,3),(4,4)\}$