Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Winter Examination-2020

Subject Name : Mathematical Concepts for Computer Science

Subject Code : 4CS01BMA2 **Branch: B.C.A.**

Semester: 1 **Date: 09/03/2021** **Time: 03:00 To 06:00** **Marks: 70**

Instructions:3

(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) Which of the following matrix is of the order2×3 ? **(01)**

a) $\begin{bmatrix} 3 & 4 \\ 9 & 3 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 3 \\ 3 & 3 \end{bmatrix}$ c) $\begin{bmatrix} 3 & 2 & 9 \\ 7 & 3 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 2 \\ 0 & 9 \\ 0 & 2 \end{bmatrix}$

b) Give one example of column matrix. **(01)**

c) If $A^2 = A$, then the matrix A is known as _____ **(01)**

a) Idempotent Matrix c) Nilpotent Matrix
b) Involutory Matrix d) Identity Matrix

d) Which of the following matrix is a type of Upper Triangular Matrix? **(01)**

a) $\begin{bmatrix} 3 & 0 & 9 \\ 0 & 3 & 8 \\ 0 & 0 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 & 0 & 0 \\ 3 & 3 & 0 \\ 9 & 0 & 3 \end{bmatrix}$
c) $\begin{bmatrix} 3 & 0 & 0 \\ 4 & 3 & 0 \\ 0 & 0 & 8 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 0 & 9 \\ 0 & 3 & 8 \\ 0 & 1 & 0 \end{bmatrix}$

e) The set $\boldsymbol{N}$denotes … **(01)**

a) The set of all positive numbers
b) The set of real numbers
c) The set of all negative numbers
d) The set of rational numbers

f) Let A and B be two sets such that $|A| = 5$, $|B| = 3$ and $|A \cup B| = 4$ then find $|A \cap B|$. **(01)**

g) Let $A = \{0,1,2\}$ write all improper subset of A. **(01)**

h) Define the following term: Reflexive Relation. **(01)**

i) What do you mean by $x \to 0$? **(01)**

j) Check whether the function $f(x) = x^3 - x^2 + 4x + 2$ is even or odd **(01)**

function?

k) If $A = \begin{bmatrix} -1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ then find A^T. **(01)**

l) $\lim_{x\to 0} \frac{sin\,3x}{x} =$ _____. **(01)**

m) Let $U = \{1,2, \ldots ,9\}$ and $A = \{1,2,6,5,8\}$ then find A^c. **(01)**

n) Let $A = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$, then $\det A =$_____ **(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) Find $adj\ A$ if $A = \begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 4 \\ 1 & 1 & 2 \end{bmatrix}$. **(05)**

c) If $A = \begin{bmatrix} 0 & 1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 3 & 5 \end{bmatrix}$ then find $3AB$. **(03)**

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

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

$$U = \{x \in \boldsymbol{N}: 1 \le x < 10\}$$

$$A = \{1,2,6,7,8,9\}, B = \{1,3,4,5,7\}, C = \{2,3,6,7,9\}$$

b) Verify Distributive Law of Union over intersection for these following sets.$A = \{1,2,6,10,15\}, B = \{1,2,4,12,14,15\}, C = \{1,2,3,8,9,10,12\}$ **(05)**

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

a) Equivalent Sets
b) Overlapping Sets

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

a) i) Draw a graph of a function $f: \mathbf{R} \to \mathbf{R}$ defind by $f(x) = 4x^2, x \in \mathbf{R}$. **(06)**

ii) Let $A = \{1,2,3,4\}, B = \{0,1,2\}\ and\ C = \{-1,2,3\}\}$ .Define relation R on set A to B by $R = \{(1,0), (2,2), (4,1)\}$ and relation S on set B to C by $S = \{(0,-1), (2,3), (1,2)\}$ Then find SoR.

b) Show that the given relation R is an Equivalence relation on a set A.where$A = \{1,2,3,4\}$and **(05)**

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

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

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

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

a) Find the inverse of matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ if possible. **(06)**

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

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

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

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

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

i) Decreasing function

ii) Onto function

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

a) In which ratio does the point $(-4,6)$ divide the line segement joining the points $P(-6,10)$ and $Q(3,-8)$? **(07)**

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

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

ii) $(-1.5,3),(6,-2),(-3,4)$

c) i) Find the distance between origin and $(36,15)$. **(03)**

ii) Find midpoint of the line segment joing the points $(1,6)$ and $(-1,0)$.

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

a) i) Let $A = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then prove that $A^2 = 3A - 2I$. **(06)**

ii) 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 matrix .

b) Find 1) $\lim_{x \to 2} 5(4x - 2)$ **(05)**

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

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

c) Let $A = \{1,2,3,4\}$ and $B = \{a,b,c,w\}$ then find $A \times B$ and $B \times A$. **(03)**

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. **(08)**

b) Verify De-Morgan's Law for the following sets: **(06)**

$U = \{1,2,\ldots,10\}, A = \{1,2,3,4,8,10\}$ *and* $B = \{2,4,8,7,10\}$