

C. U. SHAH UNIVERSITY

Summer Examination-2020

Subject Name : Mathematical Concepts for Computer Science

Subject Code : 4CS01BMA2

Branch: B.C.A.

Semester : 1

Date : 26/02/2020

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) Which of the following matrix is of the order 3×2 ? **(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) What is the cardinality of a set $\{x \in \mathbf{N}/1 < x \leq 5\}$? **(01)**

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

- a) Idempotent Matrix c) Nilpotent Matrix
b) Involutary Matrix d) Identity Matrix

d) Which of the following matrix is a type of Lower 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) $\begin{bmatrix} 3 & 0 & 0 \\ 4 & 3 & 0 \\ 1 & 0 & 8 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 0 & 9 \\ 0 & 3 & 8 \\ 0 & 0 & 0 \end{bmatrix}$

e) Give example of onto function. **(01)**

f) Give one example of odd function. **(01)**

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

h) Define : Diagonal Matrix **(01)**

i) What do you mean by $x \rightarrow \infty$? **(01)**

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

k) Consider the matrix $A = \begin{bmatrix} 3 & 0 \\ 8 & 9 \end{bmatrix}$ then the cofactor of 3 = _____ . **(01)**



- a) 27 b) -9 c) 27 d) 9

l) $\lim_{x \rightarrow 0} \frac{\sin x}{x} = \underline{\hspace{2cm}}$. (01)

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

n) Let $A = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$, then $\text{tr } A = \underline{\hspace{2cm}}$ (01)

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

Q-2 Attempt all questions. [14]

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

i) $f(x) = x^2 - 3x + 2$

ii) $f(x) = x^2 + 4$

iii) $f(x) = x^3 - 2x$

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

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

i) Increasing function

ii) Constant function

iii) Onto function

Q-3 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) Let $A = \begin{bmatrix} 3 & 6 & 0 \\ 7 & 5 & 4 \\ 1 & -2 & 1 \end{bmatrix}$ then find $A^2 + I$, where I is an identity matrix. (05)

c) Let $A = \begin{bmatrix} 7 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -1 & 2 \\ 0 & -4 & 5 \end{bmatrix}$ then find $A - 5B$. (02)

Q-4 Attempt all questions [14]

a) Let $A = \begin{bmatrix} 1 & 0 & 3 \\ 10 & 9 & 9 \\ -1 & 5 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 7 & -1 \\ 1 & 2 & 4 \\ 1 & -7 & 6 \end{bmatrix}$, then find $2AB$. (07)

b) Show that the given relation R is an Equivalence relation on a set A. (04)
 $A = \{1, 2, 3, 4\}$, $R = \{(1, 1), (1, 4), (4, 1), (4, 4), (2, 3), (2, 2), (3, 2), (3, 3)\}$.

c) Check whether the relation is reflexive or symmetric? (03)
 $A = \{1, 2, 3\}$, $R = \{(1, 1), (2, 2), (1, 3), (3, 1)\}$

Q-5 Attempt all questions [14]

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

b) Find the value of k if the points (2, 3), (4, k) and (6, -3) are collinear. (04)

c) Verify $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ for the following sets: (04)
 $A = \{1, 2, \dots, 10\}$, $B = \{6, 2, 10\}$, $C = \{2, 8, 9\}$

Q-6 Attempt all questions [14]



- a) In which ratio does the point (7,3) divide the line segment joining the points $P(4, -3)$ and $(8,5)$? (07)
- b) Find distance between two points: (04)
- Distance between (0,0) and (36,15)
 - Distance between (a,b) and (-a,-b)
- c) Find the area of triangle made by following points: (03)
- $(1, -1), (-4,6)$ and $(-3,-5)$

Q-7 Attempt all questions [14]

- a) Let $A = \begin{bmatrix} 9 & 6 & 3 \\ 4 & 4 & 1 \\ 7 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 0 & 0 \\ -2 & 4 & 0 \\ 1 & 6 & 2 \end{bmatrix}$, then find $A^2 - 2B + I$, where I is an identity matrix. (06)
- b) Verify De-Morgan's Law for the following sets: (04)
- $U = \{1,2, \dots, 15\}$, $A = \{1,4,7,10,13,15\}$ and $B = \{2,5,7,9,14\}$
- c) Define the following terms with examples: (04)
- Singleton set
 - Disjoint sets

Q-8 Attempt all questions [14]

- a) Let $A = \{x \in \mathbf{N} / 2 \leq x \leq 10\}$, $B = \{x \in \mathbf{Z} / -5 \leq x \leq 0\}$ then find $A \cup B, A \cap B, A - B$ and $B - A$. (05)
- b) Draw a Venn Diagram for the following sets: (05)
- $U = \{1,2, \dots, 14\}$, $A = \{1,3,8,10\}$, $B = \{3,4,14,12\}$, $C = \{4,6,8,11\}$
- c) Find 1) $\lim_{x \rightarrow 5} 3(9x - 2)$ (04)
- 2) $\lim_{x \rightarrow 5} \frac{x-7}{x+5}$
- 3) $\lim_{x \rightarrow 0} (4x^2 - x + 1)(x - 2)$
- 4) $\lim_{x \rightarrow 0} (x + 1)^{\frac{1}{x}}$

