SARDAR PATEL UNIVERSITY

BCA SEM-I (NC) EXAMINATION

MONDAY, 11TH NOVEMBER, 2019

02:00 PM TO 04:00 PM

US01FBCA02: MATHEMATICS-I   **Total Marks: 70**

Q:1 Choose the correct option in the following, mention the correct option with the answers in   [10]
the answer book.

(1) Median of 2, 3, 7, 9, 6, 4, 8 is

    (a) 7   (b) 6   (c) 4   (d) 9

(2) The matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is

    (a) Identity matrix   (b) Zero matrix   (c) Row matrix   (d) Column matrix

(3) If $f(x) = 2x - 1$, then $f^2(1) =$

    (a) 0   (b) 1   (c) -1   (d) 2

(4) Every monoid are:

    (a) group   (b) ring   (c) semigroup   (d) none

(5) Let A = {1, 0}, then A closed under:

    (a) multiplication   (b) addition   (c) Division   (d) Subtraction

(6) The number of elements in the power set of a set { 1, a, 2, b } are:

    (a) 2   (b) 8   (c) 16   (d) 4

(7) De Morgan's Law:

    (a) $(A \cup B)^c = A^c \cap B^c$ (b) $(A \cap B)^c = (A \cap B)^c$ (c) $(A \cup B)^c = A \cap B$ (d) None

(8) Dot product of u = (1, 2, 3), v = (0, -1, 4) is

    (a) 14   (b) (0, -2, 12)   (c) (1, 1, 7)   (d) 10

(9) The identity for a group (Z, +) is:

    (a) 1   (b) 0   (c) -1   (d) e

(10) Mode of 2, 3, 7, 9, 3, 6, 4, 8 is

    (a) 7   (b) 6   (c) 4   (d) 3

Q:2 Answer the following in short (**Attempt any Ten**).   [20]

(1) Obtain median and mode of observations 3, 5, 6, 5, 4, 7, 3, 2, 5, 7.

(2) Find the inverse of the matrix $\begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$.   (PTO)

(3) If $f(x) = x + 3$ and $g(x) = 3x + 1$ then find fog .

(4) Define: Ring and Unity of a ring.

(5) If S is a nonempty set with the operation $a*b = a$. Is the operation:

(i) associative?, (ii) commutative ?.

(6) If $A = \begin{bmatrix} 2 & 0 & -1 \\ 4 & 5 & 3 \\ 0 & 2 & 5 \end{bmatrix}$ then find $A + A^T$ and $A - A^T$.

(7) Define qualitative data.

(8) Find x, y, z if $(2x, 3, y) = (4, x + z, 2z)$.

(9) For a, b rational number, define $a*b = ab/3$. Find identity element for given binary operation.

(10) Find dual of the following:

(i) $(A \cap B \cup C)^c = (A \cup C)^c \cup (A \cup B)^c$ (ii) $(A \cup U) \cap (\phi \cup A^c) = A$.

(11) In $(Z_{10}, \times_{10})$, find 3^{-1}, 5^{-1} ,if exists.

(12) Find Arithmetic mean of the following data of marks of 10 students

48, 65, 43, 31, 57, 37, 60, 59, 49 and 77.

Q:3

(a) Prove that $1 + 2 + 3 + \ldots\ldots + n = \dfrac{n(n+1)}{2}$.   [5]

(b) Define invertible function and hence find inverse of the function $f(x) = \dfrac{2x-3}{x-2}$, $x \neq 2$.   [5]

Q:3   **OR**

(c) Let n denote a positive integer. Suppose a function L is defined as   [5]

$$L(n) = \begin{cases} 0 & \text{if } n = 1 \\ L\left(\left\lfloor \dfrac{n}{2} \right\rfloor\right) + 1 & \text{if } n > 1 \end{cases}$$ .Find L (25) and L (34) .

(d) By using algebra of sets , prove that $(\phi \cup A) \cap (B \cup A) = A$.   [5]

Q:4

(a) For $a, b \in Q$ (rational numbers), define $a*b = ab/4$.   [5]

(i) Is $(Q, *)$ Semigroup?   (ii) Is $(Q, *)$ Monoid ?

(iii) Find the inverses of elements of $(Q, *)$, if it exist.

(b) Define a group homomorphism. Show that f: $G \rightarrow G'$ defined by $f(a) = 2^a$ is a homomorphism   [5]
where G is a group of real numbers under addition and G' is a group of positive real numbers
under multiplication.

Q:4   **OR**

(c) If $G = \{1,2,3,4,5,6\}$ then prove that G is a group under multiplication modulo 7. Is it finite   [5]
group?

②

(d) For a,b rational number, define a*b = a + b + ab. Is (Q,*) commutative? Show that (Q,*) is Monoid and find its inverse if it exist. [5]

Q:5

(a) If $A = \begin{bmatrix} 2 & 4 \\ 3 & 0 \\ 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 2 & 3 \\ 7 & .1 & 5 \end{bmatrix}$ then prove that $(AB)' = B'A'$. [5]

(b) If $u = (1, 4, 3)$, $v = (-5, -2, 5)$, then evaluate: $\|u\|$, $\|v\|$, $\|u+v\|$, $\|u-3v\|$. [5]

Q:5
                                    OR

(c) Let $A = \begin{bmatrix} 1 & 3 \\ 5 & 3 \end{bmatrix}$. Find f (A), where $f(x) = x^2 - 4x -12$. [5]

(d) Define: equality of vectors, norm of a vector. Find x and y if $x(2, 1) + y(1, 6)=(7,1)$ [5]

Q:6 Find Arithmetic Mean, Medain and Mode of the following distribution: [10]

Marks	0-10	10-20	20-30	30-40	40-50
Number of students	2	8	20	16	4

OR

Q:6 Following data is regarding ages of 40 persons who attended computer seminar. [10]

18.2, 24.6, 22.4, 34.2, 37.5, 42.3, 46.7, 43.4, 51.1, 61.2, 59.7, 29.4, 20.4, 16.5, 25.9, 45.0, 15.9, 51.7, 19.9, 25.0, 32.4, 16.2, 18.0, 30.7, 44.7, 55.6, 48.0, 33.7, 27.2, 40.5, 28.5, 35.5, 64.5, 41.0, 39.5, 56.7, 27.5, 45.6, 42.5, 16.8.

Represent the data in frequency table such that one of the class 15-21.Also obtain mean Harmonic mean of the distribution.

—— X ——

(3)