

## SARDAR PATEL UNIVERSITY

BCA SEM-I EXAMINATION (NC-2010batch)

TUESDAY, 20<sup>TH</sup> NOVEMBER, 2018

2:00 pm to 4:00 pm

US01FBCA02: MATHEMATICS-I

Total Marks: 70

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

- (1) Dot product of  $u = (1, 2, 3)$ ,  $v = (0, -1, 4)$  is  
 (a) 14 (b)  $(0, -2, 12)$  (c)  $(1, 1, 7)$  (d) 10
- (2) The identity for a group  $(Z, +)$  is:  
 (a) 1 (b) 0 (c) -1 (d) e
- (3) The number of elements in the power set of a set  $\{1, 2, -1, 3\}$  are:  
 (a) 0 (b) 8 (c) 16 (d) 32
- (4) Let  $A = \{1, 3, 5, 7, \dots\}$ , then A closed under:  
 (a) multiplication (b) addition (c) division (d) subtraction
- (5) Geometric mean of  $x, y, z$  is given by:  
 (a)  $\sqrt{xyz}$  (b)  $\sqrt{x+y+z}$  (c)  $\sqrt[3]{xyz}$  (d) none
- (6) Every monoid are:  
 (a) group (b) ring (c) semigroup (d) none
- (7) If  $f(x) = 2x + 3$ , then  $f^2(0) =$   
 (a) 0 (b) 9 (c) 13 (d)  $4x + 9$
- (8) A Square matrix A is said to be skew symmetric if....  
 (a)  $A \neq A^T$  (b)  $A = -A^T$  (c)  $A = A^T$  (d) None
- (9) Median of 2, 3, 7, 9, 6, 4, 8 is  
 (a) 7 (b) 6 (c) 4 (d) 9
- (10) The range of the function  $f: R \rightarrow R$  defined as  $f(x) = 5x^2$  is:  
 (a) R (b) N (c)  $R^+$  (d) Z

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

- (1) Find the power set of a set  $A = \{1, 2, 3\}$ .

(P.T.O)

- (2) Find dual of the following:  
 (i)  $(A \cap B \cup C)^c = (A \cup C)^c \cup (A \cup B)^c$       (ii)  $(A \cup U) \cap (\phi \cup A^c) = A$ .
- (3) Find Arithmetic mean of the following data  
 50, 52, 54, 56, 58, 60, 62.
- (4) In  $(Z_{10}, \times_{10})$ , find  $3^{-1}$ ,  $5^{-1}$ , if exists.
- (5) If  $S$  is a nonempty set with the operation  $a * b = a$ . Is the operation:  
 (i) associative?, (ii) commutative ?.
- (6) For  $a, b$  rational number, define  $a * b = ab/3$ . Find identity element for given binary operation.
- (7) Define Geometric mean.
- (8) Using determinants solve the following simultaneous equations  
 $3x - 2y = 5$ ,  $5x + 4y = 1$ .
- (9) If  $A = \begin{bmatrix} 2 & 0 & -1 \\ 4 & 5 & 3 \\ 0 & 2 & 5 \end{bmatrix}$  then find  $A + A^T$  and  $A - A^T$ .
- (10) If  $f(x) = x + 3$  and  $g(x) = x^2 + 1$  then find  $(f \circ g)(x)$ .
- (11) Find Median height(in cm) of seven students for the following data  
 150, 165, 154, 156, 159, 145, 157
- (12) Find  $x, y, z$  if  $(2x, 3, y) = (4, x + z, 2z)$ .

Q:3

- (a) Define a function  $F$  as  $F(a, b) = 0$  if  $a < b$ .  
 $= F(a - b, b) + 1$  if  $b \leq a$ . [5]

Find  $F(4, 3)$  and  $F(14, 3)$ .

- (b) Define invertible function and hence find inverse of the function  $f(x) = \frac{7x - 3}{5x - 2}$ ,  
 $x \neq \frac{2}{5}$ . [5]

Q:3

OR

- (c) Prove that  $1 + 2 + 3 + \dots + n = \frac{n(n + 1)}{2}$ . [5]
- (d) By using algebra of sets, prove that  $(\phi \cup A) \cap (B \cup A) = A$ . [5]

Q:4(a) 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]

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

Q:4 OR

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

(d) For  $a, b \in Q$  (rational numbers), define  $a * b = ab/3$ . [5]

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

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

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) If  $A = \begin{bmatrix} 1 & -2 & 3 \\ 6 & 0 & 9 \\ 5 & -7 & 11 \end{bmatrix}$  then find the determinant of  $A$ . [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, Median 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.

