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# SARDAR PATEL UNIVERSITY

## FIRST SEMESTER BCA EXAMINATION

2013

WEDNESDAY, 13<sup>TH</sup> NOVEMBER

02:30 PM TO 04:30 PM

USG1FBCA02: 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) De Morgan's Law:

(a)  $(A \cup B)^c = A^c \cap B^c$       (b)  $(A \cap B)^c = (A \cap B)$

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

(2) Every monoid are:

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

(3) The number of elements in the power set of a set  $\{1, 2, 3, 4\}$  are:

(a) 0      (b) 8      (c) 16      (d) 32

(4) Let  $A = \{1, 0\}$ , then A closed under:

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

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

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

(6) Mode of 3, 7, 11, 9, 13, 1, 7, 12, 18, 6

(a) 6      (b) 7      (c) 8.5      (d) none of these

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

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

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

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

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

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

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

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

Q:2 Answer the following in short (Attempt any Ten).

[20]

- (1) For  $a, b$  rational number, define  $a*b = ab/2$ . Find identity element for given binary operation.
- (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 Median height(in cm) of seven students for the following data  
 150, 165, 154, 156, 159, 145, 157
- (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  $f(x) = x + 3$  and  $g(x) = 3x + 1$  then find fog.
- (7) If  $A = \begin{bmatrix} 2 & 0 & -1 \\ 4 & 5 & 3 \\ 0 & 2 & 5 \end{bmatrix}$  then find  $A + A^T$  and  $A - A^T$ .
- (8) Find the inverse of matrix  $\begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ .
- (9) Find  $x, y, z$  if  $(2x, 3, y) = (4, x + z, 2z)$ .
- (10) Obtain mean of observations 3, 5, 6, 10, 4, 7, 9, 12 and 10.
- (11) In  $(\mathbb{Z}_{10}, \times_{10})$ , find  $3^{-1}, 5^{-1}$ , if exists.
- (12) Define qualitative data.

**Q:3**

- (a) Prove that  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ . [5]
- (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) Define a function  $F$  as  $F(a, b) = 0$  if  $a < b$ . [5]  
 $= F(a-b, b) + 1$  if  $b \leq a$ .

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

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

**Q:4**

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

- (b) 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]

**Q:4**

**OR**

- (c) For  $a, b \in \mathbb{Q}$  (rational numbers), define  $a*b = ab/5$ . [5]  
 (i) Is  $(\mathbb{Q}, *)$  Semigroup? (ii) Is  $(\mathbb{Q}, *)$  Monoid?  
 (iii) Find the inverses of elements of  $(\mathbb{Q}, *)$ , if it exist.
- (d) For  $a, b$  rational number, define  $a*b = a + b - ab$ . Is  $(\mathbb{Q}, *)$  commutative? Show that  $(\mathbb{Q}, *)$  is Monoid and find its inverse if it exist. [5]

**Q:5**

- (a) Let  $A = \begin{bmatrix} 1 & 3 \\ 5 & 3 \end{bmatrix}$ . Find  $f(A)$ , where  $f(x) = x^2 - 4x - 12$ . [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  $A = \begin{bmatrix} 2 & 4 \\ 3 & 0 \\ 3 & 2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 2 & 3 \\ 7 & 1 & 5 \end{bmatrix}$  then prove that  $(AB)' = B'A'$ . [5]

- (d) Using determinants solve the following simultaneous equations [5]  
 $3x - 2y = 5$ ,  $5x + 4y = 1$ .

**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.

**OR**

**Q:6** Calculate Mean, Median and Mode for the following data. [10]

weight(lbs) X	130	135	140	145	146	148	149	150	157
no. of persons(f)	3	4	6	6	3	5	2	1	1