

(10 & A-8) Seat No.: _____

No of printed pages : 4

SARDAR PATEL UNIVERSITY
BCA (SEMESTER - I) EXAMINATION

Tuesday , 15th Nov.2016
MATHEMATICS : US01FBCA02
(Mathematics-I)

Time : 10:00 a.m. to 12:00 noon

Maximum Marks : 70

Que.1 Fill in the blanks.

10

- (1) The number of elements in the power set of a set $\{a, b, c, d, e\}$ are
- (a) 0 (b) 8 (c) 16 (d) 32
- (2) The set $\{x \in R / 0 < x < 1\}$ is
- (a) Finite (b) Infinite (c) Empty (d) none
- (3) If $f(x) = 2x - 3$, then $f^2(2) = \dots\dots\dots$
- (a) -1 (b) 2 (c) 0 (d) 4x-6
- (4) $(ba)^{-1} = \dots\dots\dots$
- (a) $a^{-1}b^{-1}$ (b) $(ab)^{-1}$ (c) ba (d) $b^{-1}a^{-1}$
- (5) $A = \{1, 3, 5, 7, \dots\dots\dots\}$ is closed under
- (a) addition (b) subtraction (c) division (d) multiplication
- (6) Solution of $a_1x + b_1y = c_1$, $a_2x + b_2y = c_2$ exist only if
- (a) $a_1b_2 - a_2b_1 \neq 0$ (b) $a_1b_2 - a_2b_1 = 0$ (c) $a_1b_1 - a_2b_2 \neq 0$ (d) None of these
- (7) Principle diagonal entries of skew-symmetric matrix are
- (a) Real (b) Complex (c) Zero (d) None of these
- (8) Norm of the vector $u = (-3, 0, -4)$ is
- (a) 25 (b) 7 (c) 0 (d) 5
- (9) Median of 4, 7, 3, 11, 17, 14, 9, 8 is
- (a) 9.5 (b) 9 (c) 8.5 (d) 8
- (10) Mode of 5, 7, 9, 11, 8, 18, 28, 20, 16, 14 is
- (a) 11 (b) 12.5 (c) 14 (d) does not exist

Que.2 Answer the following (Any Ten)

20

- (1) Define power set and find the power set of a set $\{1, 2, 3, 4\}$.
- (2) By using algebra of sets, prove that $A \cup (A \cap B) = A$.
- (3) Find dual of $(A \cup B \cup C)^c = (A \cup C)^c \cap (A \cup B)^c$.
- (4) Let G be the group $(\mathbb{R}, +)$ and G' be the group $\{x \in \mathbb{R} / x > 0\}$ under the usual multiplication, Define $f : G \rightarrow G'$ by $f(a) = 3^a$. show that f is homomorphism.
- (5) Let $G = \{x/x = 2^n, n \in \mathbb{N}\}$. Is G closed under multiplication? Verify it.
- (6) Let $f(x) = x^2 + 5x + 6$. Find the roots of $f(x) = 0$ over Z_{10} .
- (7) Find x, y, z if $(2x, 3, y) = (4, x + z, 2z)$.
- (8) Find $(u + v) \cdot w$ and $u \cdot w + v \cdot w$ for $u = (3, 2, 1), v = (5, -3, 4), w = (1, 6, -7)$.
- (9) Find x if $A = \begin{bmatrix} 4 & x + 2 \\ 2x - 3 & x + 1 \end{bmatrix}$ is symmetric.
- (10) Find median and mode of 8, 12, 20, 40, 8, 7, 5.
- (11) The mean of 200 items was 50. Later on it was found that two items were wrongly read as 92 and 8 instead of 192 and 88. Find out the correct mean.
- (12) Write down various measures of central tendency. Explain one of them with example.

- Que.3 (a) Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}, A = \{1, 2, 3, 4\}, B = \{3, 4, 5, 6\}$ then Prove that $n(A \cap B) = n(A) + n(B) - n(A \cup B)$.
Also find $(A \cap B)', A \cap B', A' \cap B'$. 5
- (b) If $f(x) = x^2 + 2x + 1$ then find $f(x^4) + 2, f(5x + 2), f(x - 1)$. 5

OR

- Que.3 (a) By using Mathematical induction Method, Prove that $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$. 5
- (b) Let n denote a positive integer. Suppose a function L is defined as $L(n) = \begin{cases} 0 & , \text{ if } n = 1 \\ L(\lfloor n/2 \rfloor) + 1 & , \text{ if } n > 1 \end{cases}$ 5
Find $L(25)$ and $L(34)$.
- Que.4 (a) Consider the ring $Z_{10} = \{0, 1, 2, \dots, 9\}$ of integers modulo 10. 5
(i) Find the multiplicative inverse of all elements of Z_{10} .
(ii) Find $-3, -8$ and -7 in Z_{10} .
- (b) If $f : G \rightarrow G'$ is a group homomorphism then Prove that $f(e) = e'$ and $f(a^{-1}) = f(a)^{-1}$. 5

(2)

OR

- Que.4 (a) Consider the group $G = \{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7.
(i) Find the multiplication table of G. 4
(ii) Find $2^{-1}, 6^{-1}, 5^{-1}$.
- (b) Let Q be the set of all rational numbers and * defined on Q by
 $a * b = a + b + ab$. Prove that $(Q - \{-1\}, *)$ is a commutative group. 6
- Que.5 (a) If $A = \begin{bmatrix} 2 & 6 & 1 \\ 3 & -1 & 3 \\ 3 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 & 1 \\ 0 & -1 & 1 \\ 4 & 0 & 2 \end{bmatrix}$, then prove that $(AB)^T = B^T A^T$. 5
- (b) Using Cremers rule solve the following simultaneous equations 5
 $3x - 2y = 5$, $5x + 4y = 1$.

OR

- Que.5 (a) If $A = \begin{bmatrix} 1 & -2 & 3 \\ 6 & 0 & 9 \\ 5 & -7 & 11 \end{bmatrix}$ then find $A + A^T$; $A - A^T$; AA^T . 5
- (b) If $A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 & -5 \\ 3 & 4 & 0 \end{bmatrix}$, then prove that $(AB)^T = B^T A^T$. 5
- Que.6 (a) Eight coins were tossed together and the number of heads (X) resulting was noted. The operation was repeated 256 times and the frequency distribution of the number of heads is given below. Calculate the Median. 5

| No.of heads | Frequency | No.of head | Frequency |
|-------------|-----------|------------|-----------|
| 0 | 1 | 5 | 52 |
| 1 | 9 | 6 | 29 |
| 2 | 26 | 7 | 7 |
| 3 | 59 | 8 | 1 |
| 4 | 72 | | |

- (b) The following table gives the weights of 31 persons in a sample enquiry. Calculate mean, Harmonic mean, Geometric mean, Median and Mode. 5

| Weight | No.of persons | Weight | No.of persons |
|--------|---------------|--------|---------------|
| 130 | 3 | 148 | 5 |
| 135 | 4 | 149 | 2 |
| 140 | 6 | 150 | 1 |
| 145 | 6 | 157 | 1 |
| 146 | 3 | | |

OR

3

(P.T.O.)

Que.6 (a) Prepare a frequency distribution of the number of letters in a word from the following paragraph (ignore punctuation marks) :

5

"In the beginning", said a Persian Poet, "Allah took a rose, a lily, a dove, a serpent, a little honey, a Dead Sea Apple and a handful of clay. When he looked at the amalgam - it was a woman."

Also obtain (i) the number of words with letters 6 or more

(ii) the proportion of words with 5 letters or less

(iii) the percentage of words with number of letters between 2 and 6.

(b) In a survey, it was found that 64 families bought milk in the following quantities (liters) in a particular week .

5

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 19 | 24 | 20 | 34 | 11 | 39 | 28 | 8 |
| 6 | 24 | 25 | 26 | 31 | 20 | 23 | 12 |
| 10 | 23 | 11 | 21 | 12 | 18 | 13 | 23 |
| 14 | 36 | 32 | 21 | 17 | 33 | 23 | 18 |
| 13 | 21 | 17 | 22 | 7 | 30 | 14 | 20 |
| 22 | 27 | 9 | 7 | 5 | 16 | 28 | 29 |
| 15 | 22 | 18 | 10 | 37 | 19 | 24 | 15 |
| 16 | 16 | 21 | 22 | 17 | 25 | 26 | 9 |

Convert the above data into frequency distribution using inclusive method.

XXXXXXXXXXXXXXXXXXXX

— X —
 (4)