



BRAINWARE UNIVERSITY

Term End Examination 2022

Programme – BCA-2022

Course Name – Mathematics for Computer Science

Course Code - BCAC103

(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

(i) Observe if A and B are sets. Then $A \cup B = A \cap B$ if and only if

- a) $A = \Phi$
- b) $B = \Phi$
- c) $A = B$
- d) A & B both are empty sets

(ii) Tell which of the following two sets are equal?

- a) $A = \{1,2,3\}$ and $B = \{x: x \text{ is a natural number}\}$
- b) $A = \{1, 2\}$ and $B = \{1, 2, 3\}$
- c) $A = \{1, 2, 3\}$ and $B = \{x: x \text{ is a natural number and } 0 < x < 4\}$
- d) $A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$

(iii) Tell the cardinality of the power set of the set is

- a) 128
- b) 64
- c) 32
- d) 14

(iv) Choose the true statement from given statements

- a) $A \cup \phi = \phi$
- b) $A \cap \phi = \phi$
- c) $A \cup A = \phi$
- d) $A \cap A = \phi$

(v) Choose the correct option

if $A = \{a, b, c, d, e, f, g\}$ and $B = \{k, q, l, d, e, f, g\}$, then $A \cap B$ is

- a) $\{d, e, f, g\}$
- b) $\{a, g, k\}$
- c) $\{a, b, c\}$
- d) None of the above

(vi)

Determine the value of the determinant $\begin{vmatrix} 11 & 12 & 13 \\ 13 & 14 & 15 \\ 12 & 13 & 14 \end{vmatrix}$ and that is

- a) 0
 b) 1
 c) -1
 d) 67

(vii) $\begin{bmatrix} x+3 & x+2y \\ z-1 & 4t-6 \end{bmatrix} = \begin{bmatrix} 0 & 7 \\ 3 & 2t \end{bmatrix}$, then compute the value of x, y, z, t and values are

- a) 3, -2, -4, 3
 b) -3, 5, 4, 3
 c) -3, 2, 4, -3
 d) None of these

(viii) The Arithmetic Mean of $x-2, 10, x+3, 7$ is 9. Then identify the value of x and that is

- a) 10
 b) 9
 c) 0
 d) 11

(ix) Identify the mode of the observations 2,1,1,2,3,5,2,1,2,6,4,4,21,3 and that is

- a) 3
 b) 2
 c) 4
 d) 1

(x) Identify the standard deviation of the data 5,1,7,2,6,3 and that is

- a) 1.67
 b) 2.16
 c) 3.21
 d) None of these

(xi) Fuzzy set theory defines fuzzy operations. Select the fuzzy operation from the following

- a) AND
 b) OR
 c) NOT
 d) All of these

(xii) Write the correct option

The room temperature is hot, here the hot is represented by



- a) Fuzzy set
 b) Crip set
 c) Both of these
 d) None of these

(xiii) Write the correct option

Which of the following is not a Fuzzy membership function?

- a) Trapezoidal membership function
 b) Triangular membership function
 c) Gaussian membership function
 d) Sinusoidal membership function

(xiv) Select the correct option

$$\frac{d}{dx}(\sin \sqrt{x}) =$$

- a) $\frac{1}{2\sqrt{x}} \cos \sqrt{x}$
 b) $\frac{1}{\sqrt{x}} \cos \sqrt{x}$

$$\frac{1}{2\sqrt{x}} \sin(\sqrt{x})$$

$$\frac{1}{2\sqrt{x}} \tan(\sqrt{x})$$

c) $\frac{1}{2\sqrt{x}} \sec(\sqrt{x})$

d) $\frac{1}{2\sqrt{x}} \cos(\sqrt{x})$

(xv) What is the determinant of a square null matrix

- a) 1
c) 0

- b) -1
d) none of these

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Evaluate the value of λ for which the function $f(x) = \begin{cases} \frac{\log_e^{(1+\sin 2x)}}{x}, & x \neq 0 \\ 1+\lambda, & x=0 \end{cases}$ (3)

is continuous at $x=0$

3. Show that $\sqrt{\frac{\operatorname{cosec} x + 1}{\operatorname{cosec} x - 1}} = \frac{\cos x}{1 - \sin x}$ (3)

OR

$\frac{\sec A + 1}{\tan A} = x$. Show that $\frac{\sec A - 1}{\tan A} = \frac{1}{x}$ (3)

4. Establish that $\begin{vmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{vmatrix} = 0$ (without expanding) (3)

OR

Calculate the determinant $\begin{vmatrix} 1 & \cos 60^\circ & \cos 30^\circ \\ \frac{1}{2} & \sin 30^\circ & \sin 60^\circ \\ 1 & 0 & 2 \end{vmatrix}$. (3)

5. (3)

If $A = \begin{pmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{pmatrix}$, $B = \begin{pmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & -2 & 4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{pmatrix}$, then establish

that

$$A + (B - C) = (A + B) - C$$

Solve $A + 2B = \begin{pmatrix} 1 & 3 \\ -1 & 2 \end{pmatrix}$ and $2A - B = \begin{pmatrix} 1 & 2 \\ 4 & -1 \end{pmatrix}$ and find A and B matrices (3)

6. Write the following sets in the set builder form of $B = \{1, 4, 9, 16, 25\}$ and $C = \{1, 4, 9, \dots, 100\}$. (3)

Let $A = \{a, e, I, o, u\}$ and $B = \{a, I, u\}$, then justify that $A \cup B = A$. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Evaluate the limit: $\lim_{x \rightarrow \infty} \frac{2x^2 - 9 + 3x}{3x^3 + 2x + 7}$. (5)

8. Examine the matrix $\begin{pmatrix} 1 & 3 & 5 \\ 2 & 4 & 9 \\ 5 & 7 & 8 \end{pmatrix}$ as the sum of symmetric and skew-symmetric matrices. (5)

Recognize the value of $\int \frac{\sin x}{\sqrt{1 - \cos x}} dx$ (5)

9. Two fair coins thrown. Identify the probability of getting (i) both heads (ii) one head and one tail (iii) both tails (iv) at least one head (v) three heads (vi) both heads or both tails. (5)

OR

(5)

A bag contains 5 Red, 4 Black balls. 2 balls are drawn at random, identify the probability that they match and none of them will match.

10. Examine that
$$\begin{vmatrix} 1+a & 1 & 1 & 1 \\ 1 & 1+b & 1 & 1 \\ 1 & 1 & 1+c & 1 \\ 1 & 1 & 1 & 1+d \end{vmatrix} = abcd \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d} \right)$$
 (5)

OR

$$3x + y + z = 4 \quad (5)$$

Solve the system of equations by Cramer's rule $x - y + 2z = 6$

$$x + 2y - z = -3$$

11. $f(x) = x \quad 0 < x < 1$ (5)

Let $2-x \quad 1 \leq x \leq 2$

$$x-x^2, \quad x > 2$$

Deduce that $f(x)$ is discontinuous at $x=2$.

OR

Evaluate $\frac{dy}{dx}$, where $y = \left\{ (\tan x)^{\tan x} \right\}^{\tan x}$, when $x = \frac{\pi}{4}$. (5)

12. I) Evaluate roster form of the given sets (5)

$A = \{x: x \text{ is an integer and } -3 \leq x < 7\}$ and $B = \{x: x \text{ is a natural number less than } 6\}$

(II) Evaluate $A \cup B, A \cap B$.

OR

In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. Evaluate how many speak at least one of these two languages? (5)
