(UG338) Roll No. .....

S.C.No.—2214305

B.C.A. EXAMINATION, Dec. 2024

(Third Semester)

(Main) (Batch 2022-23)

MATHEMATICAL FOUNDATION OF COMPUTING AND ANALYSIS

22USECBCA301

Time : 3 *Hours* *Maximum Marks :* 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) If $A = \{(a, b), c\}$, find the power set P(A). 2

(b) Let p and q be propositions. Using only the truth table decide whether $p \Leftrightarrow q$ does not imply $p \rightarrow \neg q$ is :

(i) True

(ii) False. 2

(c) Define Upper Triangular and Lower Triangular matrix with one example. 2

(d) Write the following statements in a symbolic forms :

p : Indian fielding improves

q : Indian will win world cup. 2

(e) The rank of the matrix $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ is : 2

(i) 4

(ii) 2

(iii) 1

(iv) 0

(f) The total number of edges in a complete graph of n vertices is : 2

(i) n

(ii) $n/2$

(iii) $n^2 - 1$

(iv) $\frac{n(n-1)}{2}$

(g) State Euler's formula of Planar Graph. 2

(h) What do you mean by Correlation Coefficient ? 2

Unit I

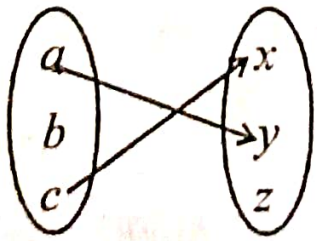
2. (a) Prove de-Morgan's law :

(i) $(A \cup B)' = A' \cap B'$ 4

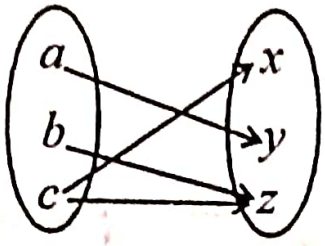
(ii) $(A \cup B)^c = A^c \cup B^c$. 4

(b) State whether or not each diagram defines a function from A = $\{a, b, c\}$ into B = $\{x, y, z\}$. 8

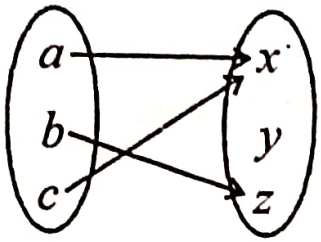
(i)



(ii)



(iii)



Or

3. (a) Consider the set Z of integers. Define aRb by $b = a^r$ for some positive integer 'r', show that R is a partial order on Z i.e., R is : **8**

(i) Reflexive

(ii) Anti symmetric

(iii) Transitive.

(b) Let $f : R \to R$ be defined by $f(x) = 2x - 3$. Now f is one-to-one and onto; hence f has an inverse function f^{-1}. Find a formula for f^{-1}. **8**

Unit II

4. (a) Show that propositions $\neg(p \wedge q)$ and $\neg p \vee q$ are logically equivalent. 8

(b) Find the truth table of $\neg p \wedge q$. 8

Or

5. (a) Find the inverse of matrix :

$$B = \begin{bmatrix} 1 & 3 & -4 \\ 1 & 5 & -1 \\ 3 & 13 & -6 \end{bmatrix}.$$ 8

(b) Given :

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 4 & -5 & 6 \end{bmatrix}$$

and $$B = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 3 & -5 \end{bmatrix}.$$

Find :

(i) A + B

(ii) 3 A and – 4B. 8

Unit III

6. (a) Define Eulerian Graph and Hamilitonian Graphs. 8

(b) Define Binary Tree with example. 8

Or

7. (a) Define Regular and bipartite graph with example. 8

(b) Explain with exmaple, tree and rooted tree. 8

Unit IV

8. (a) Two cards are drawn at random from an ordinary deck of 52 cards. Find the prabability P that : 8

(i) Both are spades

(ii) One is a spade and one is a heart.

(b) A problem in statistics is given to 5 students their chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and $\frac{1}{5}$. What is probability ? 8

Or

9. (a) Define correlation coefficient from the following table : **8**

Subject	**Age** x	**Glucose Level** y
1	43	99
2	21	65
3	25	79
4	42	75
5	57	87
6	59	81

(b) A box contains two white socks, two blue socks and two red socks. Two socks are drawn at random. Find the probability they card a match. (same colour) **8**