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Roll No. _____

22/5062+22/5063

22/5062

B.C.A. (Second Semester)

Examination, 2022

Fifth Paper [E-I]

(Fundamentals of Discrete Mathematics)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt any **five** questions. **All** questions carry equal marks.

Note : The answers to short answer type questions should not exceed **200** words and the answers to long answer type questions should not exceed **500** words.

1. (a) Prove the following : 6+6+3=15

$A\bar{G}F\bar{C}+F\bar{C}\bar{G} = F\bar{C}\bar{G}$

$X\bar{Y}\bar{Z}+\bar{X} = \bar{X}+\bar{Y}\bar{Z}$

$AB + B(B + \bar{C}) + \bar{B}C = B + C$

(b) Simplify the following expressions using the laws of Boolean Algebra :

(i) $(A + B)(\bar{A} + B)$

(ii) $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C$

(c) State and explain (i) Distribution law (ii) De Morgan's Theorem

2. (a) What is a Tautology? Explain with example. 4+4+4+3

(b) Explain 'Contradiction' with an example.

(c) Define (i) WFF and (ii) Equivalence of formulae in logic.

(d) Differentiate between Conjunctive Normal Form and Disjunctive Normal Form with an example.

3. (a) Verify the following identities using Venn Diagram : 5+5+5=15

(i) $A=(A\cap B)\cup(A-B)$

(ii) $(A \cup B) = |A| + |B| - |A \cap B|$

Where A and B are finite sets.

(b) In a group of 60 people, 27 like cold drinks, 42 like hot drinks and each person likes at least one of the two drinks. How many like both hot drinks and cold drinks?

4. (i) An integer m is related to another integer n if m is a multiple of n. What is the type of the relation? Why?

4+3+3+5=15

(ii) Write the Power Set of the Set A={1,2,3,4}.

(iii) Define partially ordered set with an example.

(iv) Let x={1,2,3,4,5,6} and R be a relation defined by $(x,y)\in R$ if and only if (x−y) is divisible by 3. Find the elements of the relation R.

5. (a) Write the truth table for $p\rightarrow q$.

4+4+4+3=15

(b) Express $A\leftrightarrow B$ in terms of connectives.

(c) How many edges are there in a graph with 10 vertices each of degree 3.

(d) Define Hamiltonian path with example.

6. (a) Show that $(N,\leq)$ is a partially ordered set where N is the set of all integers that are positive, and ≤ is a relation defined by $m\leq n$ if and only if (n−m) is a non-negative integer. 5+5+5

(b) Prove that a simple graph with n vertices and k components can not have more than $\frac{(n-k)(n-k+1)}{2}$ edges.

(c) Define Euler Graph and illustrate with example.

7. (a) Show that the propositions $p\rightarrow q$ and $\neg p\vee q$ are equivalent. 5+5+5

(b) Show that the number of odd degree vertices in a graph is even.

(c) Define Isomorphism between two graphs. Give a few illustrative examples of isomorphic graphs.

8. Write a short note on : 5+5+5

(a) Tree Traversal

(b) Complete Binary Tree

(c) Depth first search