4E4161
B. Tech. IV-Sem. (Back) Exam., Oct.-Nov. - 2020
Computer Science & Engineering
4CS2A Discrete Mathematical Structures
CS, IT

Time: 2 Hours

Maximum Marks: 48
Min. Passing Marks: 16

Instructions to Candidates:

Attempt **three questions**, selecting **one question each** from any three **unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL _____   2. NIL _____

UNIT- I

Q.1 (a) Define countable set. If $f(x) = 3x + 4$, then prove that $f(x)$ is one – one onto function for N. [8]

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(b) Define the following set – [8]

(i) Power set

(ii) Cardinality of set

(iii) Composition of function

(iv) Absolute value

OR

Q.1 (a) State and prove Pigeonhole principle. [8]

(b) Prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ [8]

UNIT- II

Q.2 (a) Define Equivalence relation with suitable example. [8]

(b) Discuss Adjacency Matrix of Relation. [8]

OR

Q.2 (a) Define Transitive closure with example. [8]

(b) Define the Warshall's Algorithm with proper example. [8]

UNIT- III

Q.3 (a) Prove by principle of mathematical induction – [8]

$$1^3 + 2^3 + 3^3 + \ldots\ldots\ldots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

(b) Explain Bubble and Selection sorting with suitable example. [8]

OR

Q.3 (a) Show that $3^n > n^2$ for any positive integer $n \geq 1$. [8]

(b) Write short notes on – [8]

(i) Direct proof

(ii) The division Algorithm

(iii) Indirect Proof

(iv) Loop Invariant

UNIT- IV

.4 (a) Write short notes on – [8]

(i) Degree of vertex in a Graph

(ii) Cycle and Wheel in a Graph

(iii) Path and Circuit

(iv) Hamiltonian Graphs

(b) Discuss Kruskal's Algorithm with examples. [8]

[1680]

Q.4 (a) Define Isomorphic Graphs with examples. [8]

(b) Explain the Minimal Spanning Tree with suitable example. [8]

UNIT- V

Q.5 (a) Define Logical Equivalences. [4]

(b) Define Quantifiers. [4]

(c) Tautology [4]

(d) Proposition [4]

OR

Q.5 (a) Find a formula in DNF and also one in CNF equivalent to: [8]

$$\{(p \rightarrow q) \wedge (q \rightarrow r)\} \vee \{(p \wedge q) \rightarrow r\}$$

(b) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a Tautology. [8]

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