23U113 (Pages: 2) Name: ....

Reg.No: ....

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2023

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U BCA1 C02 - DISCRETE MATHEMATICS

(Computer Application - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Negate each quantified propositions
   (a) Every computer is a 16-bit machine.
   (b) No person has green eyes.
2. Is the set $A = \{1, 3, 5, 7, 9\}$ a subset of $B = \{1, 2, 3, 5, 6, 7\}$? Justify.
3. Draw the logic gate circuit for the Boolean expression $(A.B) + (A.C)$.
4. Define initial node of the edge in a graph with an example.
5. Define isomorphism.
6. Define closed walk.
7. Show that a complete graph of n vertices is $(n-1)-$ regular.
8. Prove or disprove
   (a) Spanning tree of a connected graph G is a skeleton of G.
   (b) Spanning tree of a connected graph G is a maximal tree of G.
9. Define weighted graph and minimal spanning tree.
10. Write the difference between cut-set and cut vertex.
11. Draw a graph for connected graphs and unconnected graphs with five vertices.
12. What is the difference between strong component and weak component?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Evaluate the boolean expression where $a = 2, b = 3, c = 5$ and $d = 7$
    (a) $\sim \{(a \leq b) \wedge [\sim (c > d)]\}$ (b) $\sim [(a > b) \vee (b \leq d)]$

14. Determine whether

(a) $[(p \to q) \wedge (\sim q)] \to \sim p$ is a tautology. (b) $\sim p \leftrightarrow (p \vee \sim p)$ is a contradiction.

15. Using truth tables, prove the De-Morgans laws in a boolean algebra.

16. Explain the concept of chromatic number on complete graph, wheel graph and $n-$star graph.

17. Explain bipartite and complete bipartite graph with suitable examples.

18. (a) Explain pendant vertex with an example.

(b) Explain distance, eccentricity and center in a graph.

19. Show that a complete graph of five vertices is non planar.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. (i) Show that the relation R in the set $\mathbb{Z}$ of integers given by $R = \{< a, b >:\ 2 \text{ divides } a - b\ \}$ is an equivalence relation on $\mathbb{Z}$.

(ii) Give an example of a relation, which is reflexive and transitive, but not symmetric.

21. (i) Let $A = \{1, 2, 3\}$, X denotes the power set of A. Then draw the Hasse diagram for the inclusion relation on X defined by $\subseteq = \{< A', A'' >: A' \subseteq A'', A' \in X, A'' \in X\}$.

(ii) Find the least member and greatest member, if any, in this poset.

(iii) Find the minimal members and maximal members, if any, in this poset.

(1 × 10 = 10 Marks)

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