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Name.....

Reg. No.....

THIRD SEMESTER (CBCSS-UG) DEGREE EXAMINATION, NOVEMBER 2024

Information Technology

BIT 3C 05—DISCRETE MATHEMATICS

(2019—2023 Admissions)

Time : Two Hours

Maximum Marks : 60

Section A (Short Answer Type Questions)

*All questions can be answered.
Each question carries 2 marks.
(Ceiling 20 marks)*

1. What is cardinality of sets ?
2. Define partial ordering relations.
3. Is the “divides” relation on the set of positive integers symmetric or not ?
4. Use a membership table to show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
5. Define Planar graphs. Show that K_4 planar.
6. Define chromatic number of a graph. What is the chromatic number of K_n ?
7. Show that the distributive law $x(y + z) = xy + xz$ is valid.
8. Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
9. Find the value of the Boolean function represented by $F(x, y, z) = xy + \bar{z}$.
10. Define a directed graph. Give an example of a directed graph.
11. What is the cartesian product $A \times B \times C$, where $A = \{0, 1\}$, $B = \{1, 2\}$ and $C = \{0, 1, 2\}$?
12. What is the truth value of the quantification $\exists x p(x)$, where $p(x) = x > 3$ and the domain consists of all real numbers ?

Section B

*All questions can be answered.
Each question carries 5 marks.
(Ceiling 30 marks)*

13. Find the greatest lower bound and the least upper bound of the sets $\{3, 9, 12\}$ and $\{1, 2, 4, 5, 10\}$, if they exist, in the poset $(Z^+, |)$.

Turn over

14. Determine whether the relation R on $\{0, 1, 2, 3\}$ to itself is an equivalence relation where $R = \{(0, 0), (0, 1), (0, 2), (1, 0), (1, 1), (1, 2), (2, 0), (2, 2), (3, 3)\}$.
15. Define Bipartite graphs. Show that C_6 is bipartite.
16. Prove that a simple graph is connected if and only if it has a spanning tree.
17. Explain different connectives used in propositional calculus.
18. Explain set operations with Venn diagrams.
19. Explain duality principle, construct an identity from $x(x + y) = x$ by taking duals.

Section C

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

20. (a) What is a minimum spanning tree of a connected weighted graph ?
(b) Describe Prim's algorithm for finding minimum spanning tree.
21. Find the sum of products expansion and product of sum expansion for $F(x, y, z) = (x + y)\bar{z}$.
(1 × 10 = 10 marks)