INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, NAGPUR
Department of Computer Science & Engineering
CSL204: Discrete Maths & Graph Theory

End Sem Exam
Duration: 3 hour

Date: May 11, 2022 (Wed)

Semester – IV

Max. Marks: 50

Important Instructions:

- This is a closed book, closed notes examination.
- This question paper comprises total 10 questions.
- All the questions are compulsory.

Q1 A) Let $(A, \vee, \wedge, \neg)$ be a Boolean Algebra. Show that there is a unique inverse for every element. (2)

B) Let a, b, c be elements in a lattice $(A, \leq)$. Show that $a \vee (b \wedge c) \leq (a \vee b) \wedge (a \vee c)$. (3)

Q2 Using Pigeonhole Principle or otherwise, show that every element of a finite group has a finite order. (5)

Q3 A) A graph G has n vertices each of degree d. What is the minimum degree d, in order to guarantee that G must be connected. (3)

B) Prove: If a tree has vertex of degree p, then it has at least p vertices of degree 1. (2)

Q4 A) Draw a graph that has every vertex of degree-2 but does not have a Hamiltonian cycle. (2)

B) Draw a 4-connected graph that does not have an Eulerian tour. (3)

Q5 Prove that every 3-vertex connected graph with 8-vertices has atleast 11 edges. (5)

Q6 Prove that every k-vertex connected graph with n-vertices has atleast (kn/2) edges. (5)

Q7 7. Find the validity of the following statement (5)

If p and q, then r

If ~p and ~q, then ~r

(p AND q) equals r

Q8 A) Let A and B be two sets. What can be possibly said about A and B if: (3)

(a) $A - B = A$ (b) $A - B = B - A$ (c) $A - (A - B) = B$

B) Two different equivalence relations R_1 and R_2 are defined over the same set. Prove that: (2)

(a) $R_1 \cap R_2$ is an equivalence relation. (b) $R_1 \cup R_2$ is an equivalence relation.

Q9 A) Show that among $n+1$ arbitrarily chosen integers from the set $\{1, 2 \ldots 3n\}$, there are two whose difference is less than or equal to 2. (3)

B) Using pigeonhole principle, show that every sum of consecutive n integers is divisible by n. (2)

Q10 Prove by induction that for all positive integers $(n*n*n - n)$ is divisible by 6. (5)

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Moderator

paper set by
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