

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I Computer Science & Business System : WINTER- 2022
SUBJECT : DISCRETE MATHEMATICS

Day : Monday

Time : 10:00 AM-01:00 PM

Date : 9/1/2023

W-24130-2022

Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.
- 4) Draw neat labeled diagrams **WHEREVER** necessary.

Q.1 Show that $\neg P \wedge (\neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ without using truth table. (10)

OR

Q.1 Use rules of inference to obtain the conclusion of the following arguments: (10)
"John is a student in this class, knows how to write programme in Java".
"Everyone who knows how to write programme in Java can get a high paying job". Therefore, "Someone in this class can get a high paying job".

Q.2 Prove De Morgan's theorem without using truth table. (10)

OR

Q.2 A new employee checks the hats of 10 people at restaurant forgetting to put claim check numbers on the hats. When customers return for their hats, the checker gives them back hats chosen at random from the remaining hats. What is the probability that no one receives the correct hat? (10)

Q.3 How many onto functions are there from a set with 6 elements to set with 3 elements? (10)

OR

Q.3 Define function, domain and image. Also explain with examples what is surjection, injection and a bijection functions? (10)

Q.4 Prove that every subgroup of a cyclic group is cyclic. (10)

OR

Q.4 Show that if every element in a group is its own inverse, then the group must be Abelian. (10)

Q.5 How many positive integers not exceeding 1000 are divisible by none 3, 7 and 11. (10)

OR

Q.5 Use mathematical induction to show that n^2-1 is divisible by 8 whenever n is an odd positive integer. (10)

Q.6 Show that a simple graph G is Eulerian if and only if all its vertices have even degree. (10)

OR

Q.6 Let $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ with a relation $x \leq y$ if and only if x divides y . (10)
i) Draw Hasse diagram of D_{30}
ii) Determine all lower and upper bounds of 10 and 15.