BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - III CS&E : WINTER : 2023
SUBJECT : DISCRETE MATHEMATICAL STRUCTURES

Day : Tuesday
Date : 5/12/2023

W-25311-2023

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Assume suitable data if necessary.
5) Use of non-programmable **CALCULATOR** is allowed.

Q.1 Prove that $\sqrt{2}$ is irrational using proof by contradiction. **(10)**

OR

Q.1 Prove tautology $[(P \rightarrow Q) \wedge (Q \rightarrow R)] \rightarrow (P \rightarrow R)$ using logical connectives. **(10)**

Q.2 In a mathematics contest with 3 problems, 80% of participants solved the first problem, 75% solved the second problem and 70% solved the third. Prove that at least 25% of the participants solved all 3 problems. **(10)**

OR

Q.2 Suppose that 4 cards labeled 1 to 4 are placed randomly into 4 boxes also labeled 1 to 4 one card per box, what is the probability that no card gets placed into a box having the same label as the card? **(10)**

Q.3 Determine whether the relation R on the set of all integer is reflexive, symmetric, antisymmetric and transitive where $(x,y) \in R$ if and only if **(10)**

i) $x \equiv y \pmod 7$ ii) $x \geq y^2$ iii) $xy \geq 1$

OR

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

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

OR

Q.4 In any group $<G, *>$ show that $(a * b)^{-1} = b^{-1} * a^{-1}$ for all $a, b \in G$. **(10)**

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

OR

Q.5 Find the no. of integers between 1 and 250 that are divisible by any of integer 2, 3, 5 and 7. **(10)**

Q.6 Prove that a bipartite graph with n vertices has maximum of $n^2/4$ edges. **(10)**

OR

Q.6 Establish isomorphism for following graphs. **(10)**

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