
Discrete Mathematics

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INSTRUCTIONS :

- The duration of this test is: 2 hours
 - Answer any four of the five questions given below. All questions carry equal marks.
 - Write legibly and clearly. Do not jump steps.
1. Define set intersection as a predicate formula. Use the predicate “belongsto” (i.e. set membership “ ϵ ”) as the base for such a definition.
 2. What is the power set of the empty set ? What is the power set of the set $\{\phi\}$?
 3. Express the statement: *If a person is female, and is a parent, then this person is someone’s mother* as a logical expression involving predicates, quantifiers (over a domain of people), and logical connectives.
 4. Prove that for a conditional statement of the form $S : P \longrightarrow Q$, the contrapositive of S is equivalent to S.
 5. Explain *proof by contradiction*, using propositional logic notation (quantifier, implication, negation, contradiction etc.)

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