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Assignment #1: LEC-AS1 – SET & PROPOSITION

1. What is the powerset of the empty set?

The powerset of the empty set is a set containing only the empty set. Mathematically: P(∅) = {∅}

2. What is the power set of set {0}?

The power set of {0} contains all possible subsets: P({0}) = {∅, {0}}

3. List 5 elements in each of the following sets

a. { n ∈ A: n + 1 is a prime}

Corrected elements: 1, 4, 6, 10, 14 (These are numbers where n + 1 is a prime number)

* 1 + 1 = 2 (prime)
* 4 + 1 = 5 (prime)
* 6 + 1 = 7 (prime)
* 10 + 1 = 11 (prime)
* 14 + 1 = 15 (prime)

b. { 2ⁿ: n ∈ B}

Elements: 1, 2, 4, 8, 16 (These are numbers generated by 2 raised to different powers)

* 2⁰ = 1
* 2¹ = 2
* 2² = 4
* 2³ = 8
* 2⁴ = 16

4. Propositional Logic

Propositional logic is a branch of mathematical logic that deals with:

* Propositions (statements that are either true or false)
* Logical connections between propositions
* Evaluating the truth value of compound statements

Key characteristics:

* Binary truth values (True or False)
* Uses logical connectives to combine propositions
* Fundamental to mathematical reasoning and computer science

5. Logical Connectives with Examples

Negation (¬)

* Reverses the truth value of a proposition
* Example: ¬(2 + 2 = 5) is True

Conjunction (∧)

* True only when both propositions are true
* Example: (3 > 2) ∧ (4 < 5) is True

Disjunction (∨)

* True if at least one proposition is true
* Example: (1 = 2) ∨ (3 > 1) is True

Implication (→)

* False only when the first proposition is true and the second is false
* Example: (x > 0) → (x² > 0) is True

Biconditional (↔)

* True when both propositions have the same truth value
* Example: (4 is even) ↔ (4 is divisible by 2) is True

6. References

1. Rosen, K. H. (2012). Discrete Mathematics and Its Applications. McGraw-Hill.
2. Epp, S. S. (2010). Discrete Mathematics with Applications. Brooks/Cole.
3. Johnsonbaugh, R. (2008). Discrete Mathematics. Pearson Prentice Hall.