CSCE 222-501 Discrete Structures for Computing
Fall 2014 – Hyunyoung Lee

Problem Set 1

Due dates: Electronic submission of hw1.tex and hw1.pdf files of this homework is due on **9/15/2014 (Monday) before 11:59 p.m.** on `https://csnet.cs.tamu.edu`. A signed paper copy of the pdf file is due on **9/16/2014 (Tuesday)** at the beginning of class.

Name: Eric E. Gonzalez

Resources. (Discrete Mathematics and its Applications 7th Edition by Rosen)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: _____

Problem 1. (2 pts × 5 = 10 points) Section 2.1, Exercise 8 b), c), d), e), and f), page 125

Solution. b) No c) Yes d) Yes e) Yes f) No

Problem 2. (2 pts × 5 = 10 points) Section 2.1, Exercise 10 b), d), e), f), and g), page 125

Solution. b) True d) True e) True f) True g) False

Problem 3. (10 points) Section 2.1, Exercise 26, page 126. Prove your answer.

Solution. The Cartesian Product of sets A and B is $A \times B = \{(a,b) \mid a \in A \wedge b \in B\}$. That of C and D is $C \times D = \{(c,d) \mid c \in C \wedge d \in D\}$. If $A \subseteq C$ and $B \subseteq D$, then the product of A and B must must be less than or equal to that of the larger sets C and D, and also include only elements that are already present in the two supersets. Therefore, we can conclude that $A \times B \subseteq C \times D$.

Problem 4. (2.5 pts × 4 = 10 points) Section 2.2, Exercise 2, page 136

Solution. a) $A \cap B$
b) $A - (A \cap B)$
c) $A \cup B$
d) $\overline{A} \cup \overline{B}$

Problem 5. (3 + 3 + 4 = 10 points) Section 2.2, Exercise 16 a), b), and d), page 136

Solution. a) A⊆B = {x|x ∈ (A∩B)} = {x|x ∈ A and B intersections} ⊆ {x|x ∈ A}
Therefore, (A∩B)⊆A.
b) A∪B forms a superset composed of all elements of A combined with all elements of B. As such, all of set A is included in A∪B. Therefore, A ⊆(A∪B).
d) Because B - A results in a set containing all elements of B not present in A, there are no common elements left between A and (B - A) that intersect. Therefore, A ∩ (B - A) = ∅

Problem 6. (5 pts × 2 = 10 points) Section 2.2, Exercise 50 b) and c), page 137

Solution. b) $\cup_{i=1}^{\infty} A_i = \{0,1\} \cup \{0,2\} \cup \{0,3\} \cup ... \cup \{0,n\} = \{0,1,2,3,...\} = Z^+$
$\cap_{i=1}^{\infty} A_i = \{0,1\} \cap \{0,2\} \cap \{0,3\} \cap ... = \{0\}$
c) $\cup_{i=1}^{\infty} A_i = (0,1) \cup (0,2) \cup (0,3) \cup ... \cup (0,n) = (0,\infty) = Z^+$
$\cap_{i=1}^{\infty} A_i = (0,1) \cap (0,2) \cap (0,3) \cap (0,n) \cap ... = (0,1)$

Problem 7. (2.5 pts × 4 = 10 points) Section 2.3, Exercise 12, page 153

Solution. a) One-to-one
b) Not one-to-one
c) One-to-one
d) Not one-to-one

Problem 8. (10 points) Section 2.3, Exercise 14, page 153

Solution. a) Onto
b) Not onto
c) Onto
d) Onto
e) Not onto

Problem 9. (10 points) Section 2.3, Exercise 56, page 154

Solution. n = ($\lfloor b \rfloor$ - $\lceil a \rceil$) + 1

Problem 10. (2.5 pts × 4 = 10 points) Section 2.3, Exercise 58, page 154

Solution. a) 4 bits will require one byte
b) 10 bits will require 2 bytes
c) 500 bits will require 63 bytes
d) 3000 bits will require 375 bytes

Checklist:

1. Did you add your name?
2. Did you disclose all resources that you have used?
   (This includes all people, books, websites, etc. that you have consulted)
3. Did you sign that you followed the Aggie honor code?
4. Did you solve all problems?
5. Did you submit (a) your latex source file and (b) the resulting pdf file of your homework on CSNet?
6. Did you submit (c) a signed hardcopy of the pdf file in class?