CSCE 222 [Section 501] Discrete Structures for Computing
Spring 2019 – Hyunyoung Lee

Problem Set 2

Due dates: Electronic submission of *yourLastName-yourFirstName-hw2.tex* and *yourLastName-yourFirstName-hw2.pdf* files of this homework is due on **Wednesday, 2/6/2018, before 10:00 p.m.** on `http://ecampus.tamu.edu`. You will see two separate links to turn in the .tex file and the .pdf file separately. Please do not archive or compress the files. **If any of the two files are missing, you will likely receive zero points for this homework.**

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Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework.)

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.

Electronic signature: Kim Nguyen

*** Please make sure that you are solving the correct problems from the <u>8th Edition of the Rosen book</u>, not the 7th Edition! ***

Problem 1. (5 points × 2 = 10 points) Section 1.4, Exercise 10 b) and c), page 57.

Solution. .
b) $\forall x(C(x) \wedge D(x) \wedge F(x))$
c) $\exists x(C(x) \wedge F(x) \wedge \neg D(x))$

Problem 2. (5 points × 2 = 10 points) Section 1.4, Exercise 20 c) and d), page 57.

Solution. .
c) P(-5) $\wedge P(-3) \wedge P(-1) \wedge P(3) \wedge P(5)$
d) $P(1) \vee P(3) \vee P(5)$

Problem 3. (2.5 points × 4 = 10 points) Section 1.4, Exercise 36, page 58.

Solution. .
a) $\forall x((-2 < x) \wedge (x < 3))$
b) $\forall x((0 \le \text{x}) \wedge (x < 5))$
c) $\exists x((-4 \le \text{x}) \wedge (x \le 1))$
d) $\exists x((-5 < x) \wedge (x < -1))$

Problem 4. (5 points × 4 = 20 points) Section 1.5, Exercise 28 a), b), c) and d), page 71. *Justify your answer or give a counterexample.*

Solution. .
a) True
b) True
c) False
d) False

Problem 5. (10 points × 2 = 20 points) Section 1.6, Exercise 14 c) and d), page 83.

Solution. .
c) Conjunction
d) Hypothetical Syllogism

Problem 6. (5 points) Section 1.7, Exercise 2, page 95.

Solution. .
Proof: Let integers n and m be even integers such that n = 2k and m = 2j for any integers j and k. Then m + n $\iff$ 2k + 2j $\iff$ 2(k + j) $\iff$ 2z. Since z is an integer then we can conclude that if m and n are even integers then the sum of m and n is also even.

Problem 7. (5 points) Section 1.7, Exercise 6, page 95.

Solution. .
Proof: Let integers n and m be odd integers such that n = 2k + 1 and m = 2j + 1 for any integers j and k. Then mn $\iff$ (2k + 1)(2j + 1) $\iff$ 4kj + 2k + 2j + 1 $\iff$ 2(2kj + j + k) + 1 $\iff$ 2z + 1. Since z is an integer then we can conclude that if m and n are odd integers then the product of m and n is also odd.

Problem 8. (10 points) Prove by *contradiction* that if $n \geq 1$ is a perfect square, then $n + 2$ is not a perfect square.

Solution. .
Let p be the proposition that if integer n $\geq$ 1 is a perfect square, then n + 2 is not a perfect square. For proof by contradiction, we suppose that ¬p is true. Since ¬p states that integer n $\geq$ 1 is a perfect square and n + 2 is a perfect square. If ¬p is true then we can set n = t^2 and n + 2 = s^2 such that t and s are integers. Let n = 4, then n + 2 = 6 but 6 is not a perfect square. Thus, we have a contradiction.

Problem 9. (10 points) Prove by *contradiction* that at least three of any 25 days chosen must fall in the same month of the year.

Solution. .
Let p be the proposition that at least three of any 25 days chosen must fall in

the same month of the year. For proof by contradiction, suppose that $\neg p$ is true. Since $\neg p$ states that there are less than three days of any 25 days chosen that must fall in the same month of the year. There are 12 months in a year and at most 2 must fall in the same month of the year. Then 12×2 is 24 but we must choose from 25 days so at least three days must be chosen in the same month of the year. Thus we have a contradiction.

Checklist:
☐ Did you type in your name and UIN?
☐ Did you disclose all resources that you have used?
  (This includes all people, books, websites, etc. that you have consulted.)
☐ Did you sign that you followed the Aggie Honor Code?
☐ Did you solve all problems?
☐ Did you submit the .tex and .pdf files of your homework to the correct link on eCampus?