CSE 211: Discrete Mathematics	**(Due: 27/10/19)**

Homework #1

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Course Policy: Read all the instructions below carefully before you start working on the assignment, and before you make a submission.

- It is not a group homework. Do not share your answers to anyone in any circumstance. Any cheating means at least -100 for both sides.

- Do not take any information from Internet.

- No late homework will be accepted.

- For any questions about the homework, send an email to gizemsungu@gtu.edu.tr

- Submit your homework into Assignments/Homework1 directory of the CoCalc project CSE211-2019-2020.

Problem 1: Conditional Statements   (5+5+5=15 points)

State the converse, contrapositive, and inverse of each of these conditional statements.

(a) If it snows tonight, then I will stay at home.
(Solution)

Converse:

Contrapositive:

Inverse:

(b) I go to the beach whenever it is a sunny summer day.
(Solution)

Converse:

Contrapositive:

Inverse:

(c) When I stay up late, it is necessary that I sleep until noon.
(Solution)

Converse:

Contrapositive:

Inverse:

| **Problem 2: Truth Tables For Logic Operators** | (5+5+5=15 points) |

Construct a truth table for each of the following compound propositions.

(a) (p ⊕ ¬ q)

(Solution)

(b) (p ⟺ q) ⊕ (¬ p ⟺ ¬ r)

(Solution)

(c) $(p \oplus q) \Rightarrow (p \oplus \neg q)$
(Solution)

Problem 3: Logic in Algorithms   (10+10+10=30 points)

If $x = 1$ before the statement is reached, what is the value of x after each of these statements is encountered in a computer program? Why? Show your work step by step.

(a) for $i \Leftarrow 1$ **to** 10 **do**

      if $x + 2 = 3$ **then** $x := x + 1$

    end

(Solution)

(b) for $i \Leftarrow 1$ **to** 5 **do**

      if $(x + 1 = 2)$ XOR $(x + 2 = 3)$ **then** $x := x + 1$

    end

(Solution)

(c) for $i \Leftarrow 1$ **to** 4 **do**

      if $(2x + 3 = 5)$ AND $(3x + 4 = 7)$ **then** $x := x + 1$

    end

(Solution)

Problem 4: Proof by contradiction   (20 points)

Show that at least three of any 25 days chosen must fall in the same month of the year using a proof by contradiction. Explain your work step by step.
(Solution)

Problem 5: Proof by contraposition   (20 points)

Show that if $n^3 + 5$ is odd, then n is even using a proof by contraposition. Explain your work step by step.
Note: Assume that n is an integer.
(Solution)