

## Assignment No. 2

EECS 210

Discrete Structures

Due: 11:59 PM, Thursday, September 15, 2022

Submit deliverables in a single zip file to Canvas

Name of the zip file: FirstnameLastname\_Assignment2 (with your first and last name)

Name of the Assignment folder within the zip file: FirstnameLastname\_Assignment2

### Deliverables:

1. Copy of Rubric2.docx with your name and ID filled out (do not submit a PDF)
2. Source code.
3. Screen print showing the successful execution of your code or copy and paste the output from a console screen to a Word document and PDF it.

### Assignment:

- You may use any language you want, but if you want help from me or one of the SIs, you should probably use C++ or Python.
- Create a program for the following:
  1. Prove (true) or disprove (false) the following assertions for the domain of  $\{0,1,2,3,4,5,6,7,8,9,10\}$ . For the universal quantifier, show at least one of the numbers in the domain that disproves the assertion. For the existential quantifier, show at least one number in the domain that proves the assertion:
    - a)  $\exists x P(x)$ , where  $P(x)$  is the statement " $x < 2$ "
    - b)  $\forall x P(x)$ , where  $P(x)$  is the statement " $x < 2$ "
    - c)  $\exists x (P(x) \vee Q(x))$  where  $P(x)$  is the statement " $x < 2$ " and where  $Q(x)$  is the statement " $x > 7$ "
    - d)  $\forall x (P(x) \vee Q(x))$  where  $P(x)$  is the statement " $x < 2$ " and where  $Q(x)$  is the statement " $x > 7$ "
    - e) Prove De Morgan's Law for the Existential Quantifier where  $P(x)$  is the statement " $x < 5$ "
    - f) Prove De Morgan's Law for the Universal Quantifier where  $P(x)$  is the statement " $x < 5$ "
  2. Find the following truth values for the domain of  $\{0,1,2,3,4,5,6,7,8,9,10\}$  where  $P(x,y): x \cdot y = 0$ . Show the values in the domain that either make the assertions true or false. (See Example 1 and 2 for "Order of Quantifiers" in the 9-1 lecture on Nested Quantifiers).
    - a)  $\forall x \forall y P(x,y)$
    - b)  $\forall x \exists y P(x,y)$
    - c)  $\exists x \forall y P(x,y)$
    - d)  $\exists x \exists y P(x,y)$
- Print out a line between each of the above indicating which number your program is answering, (e.g., 1b).
- Provide comments that explain what each line of code is doing. See rubric below.

Rubric for Program Comments		
Exceeds Expectations (90-100%)	Meets Expectations (80-89%)	Unsatisfactory (0-79%)
Software is adequately commented with prologue comments, comments summarizing major blocks of code, and comments on every line.	Prologue comments are present but missing some items or some major blocks of code are not commented or there are inadequate comments on each line.	Prologue comments are missing all together or there are no comments on major blocks of code or there are very few comments on each line.

Remember:

- Your Programming Assignments are individual-effort.
- You can brainstorm with other students and help them work through problems in their programs, but everyone should have their own unique assignment programs.