

Assignment No. 4

EECS 210

Discrete Structures

Due: 11:59 PM, Thursday, October 12, 2023

Submit deliverables in a single zip file to Canvas

Files in other formats (e.g., .tar) will not be graded

Name of the zip file: FirstnameLastname_Assignment4 (with your first and last name)

Name of the Assignment folder within the zip file: FirstnameLastname_Assignment4

Deliverables:

1. Copy of Rubric4.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.
- Use the methods or functions inherent in the language and/or using methods or functions you create. Like previous assignments, don't "hard code" a solution you did on paper as the output.
- Create a program for the following:
 1. Write code that determines if a relation (R) of ordered pairs is reflexive or not & then if it is not, finds the reflexive closure of R (R^*). The output should be:
 - a) $R = \{\dots\}$
 - b) R is or is not reflexive
 - c) R^* if it is not reflexive
 - d) Show the code works for the relation $\{(1,1), (4,4), (2,2), (3,3)\}$ on the set $\{1,2,3,4\}$.
 - e) Show the code works for the relation $\{(a,a), (c,c)\}$ on the set $\{a,b,c,d\}$.
 2. Write code that determines if a relation (R) of ordered pairs is symmetric or not & then if it is not, finds the symmetric closure of R (R^*). The output should be:
 - a) $R = \{\dots\}$
 - b) R is or is not symmetric
 - c) R^* if it is not symmetric
 - d) Show the code works for the relation $\{(1,2), (4,4), (2,1), (3,3)\}$ on the set $\{1,2,3,4\}$.
 - e) Show the code works for the relation $\{(1,2), (3,3)\}$ on the set $\{1,2,3,4\}$.
 3. Write code that determines if a relation (R) of ordered pairs is transitive or not & then if it is not, finds the transitive closure of R (R^*) using Warshall's Algorithm. The output should be:
 - a) $R = \{\dots\}$
 - b) R is or is not transitive
 - c) R^* if it is not transitive

- d) Show the code works for the relation $\{(a,b), (d,d), (b,c), (a,c)\}$ on the set $\{a,b,c,d\}$.
 - e) Show the code works for the relation $\{(1,1),(1,3),(2,2),(3,1),(3,2)\}$ on the set $\{1,2,3\}$.
4. Write code that determines if a relation (R) of ordered pairs is an equivalence relation or not and the reason why. The output should be:
- a) $R = \{\dots\}$
 - b) R is or is not an equivalence relation
 - c) The reasons why, if it is not an equivalence relation (i.e., it is not reflexive, and/or it is not symmetric, and/or it is not transitive).
 - d) Show the code works for the relation $\{(1,1),(2,2),(2,3)\}$ on the set $\{1,2,3\}$.
 - e) Show the code works for the relation $\{(a,a),(b,b),(c,c),(b,c),(c,b)\}$ on the set $\{a,b,c\}$.
5. Write code that determines if a relation (R) of ordered pairs is a poset of the set (S) or not and the reason why. The output should be:
- a) $S = \{\dots\}$
 - b) $R = \{\dots\}$
 - c) (S,R) is or is not a poset
 - d) The reason why, if it is not poset (i.e., it is not reflexive, and/or it is not antisymmetric, and/or it is not transitive).
 - e) Show the code works for the relation $\{(1,1), (1,2), (2,2), (3,3), (4,1), (4,2), (4,4)\}$ on the set $\{1, 2, 3, 4\}$.
 - f) Show the code works for the relation $\{(0, 0), (0, 1), (0, 2), (0, 3), (1, 0), (1, 1), (1, 2), (1, 3), (2, 0), (2, 2), (3, 3)\}$ on the set $\{0, 1, 2, 3\}$.
- 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.

Adequate Prologue Comments:

- Name of program contained in the file (e.g., EECS 210 Assignment 3)
- Brief description of the program, e.g.:
 - Python code for demonstrating operations on relations and properties of relations.
- Inputs (e.g., none, for a function, it would be the parameters passed to it)
- Output, e.g.,
 - Print out of the name of each exercise, followed by the exercise's output.

- All collaborators
- Other sources for the code ChatGPT, stackOverflow, etc.
- Author's full name
- Creation date: The date you first create the file, i.e., the date you write this comment

Adequate comments summarizing major blocks of code and comments on every line:

- Provide comments that explain what each line of code is doing.
- You may comment each line of code (e.g., using `//`) and/or provide a multi-line comment (e.g., using `/*` and `*/`) that explains what a group of lines does.
- Multi-line comments should be detailed enough that it is clear what each line of code is doing.
- Each block of code must indicate whether you authored the code, you obtained it from one of the sources listed in the prolog, or one of your collaborators authored the code, or if it was a combination of all of these.

Collaboration and other sources for code:

- When you collaborate with other students or use other sources for the code (e.g., ChatGPT, stackOverflow):
 - Your comments must be significantly different from your collaborators.
 - More scrutiny will be applied to grading your comments in particular explaining the code “in your own words”, not the source’s comments (e.g., ChatGPT’s comments).
- Failure to identify collaborators or other sources of code will not only result in a 0 on the assignment but will be considered an act of Academic Misconduct.
- Students who violate conduct policies will be subject to severe penalties, up through and including dismissal from the School of Engineering.