ICS 6B F23 Take Home Exam 7

Due: November 17th, 2023 at 11:59PM

Name: _____

UCI NetID : | | | | | | | | |

(**alpha-numeric; NOT your student ID**)

- **Read** the instructions of each question carefully.
- **All problems will have a "What to show" section that will describe exactly what work is expected of you we solving the problem. Failure to meet the requirements of the "What to show" sections will result in a Not Yet. If you have questions about what to show please ask on Ed.**
- An answer where thought process is unclear will be given a grade of Not Yet
- Your submission should follow the template exactly. Any insertion, removal, or reordering of pages from the original template may result in readers not grading certain problems. In such an event you will receive "Not Yet" and no feedback on the problems in question.
- Place your answers in the boxed regions. Writing outside of the boxes will not be considered as part of your answers.
- This exam will cover the Outcomes from the R Learning Objective
- Please keep in mind of the academic honesty guidelines. This take-home exam is to be **completed individually, with no outside help**. You may use any resources from our class (ZyBooks and resources from Canvas), but you may not use any other online resources.
- You may choose to print the exam or use a digital editor for completing the exam. It is required that you use this PDF to complete your work. If you have no access to a printer or digital tools to fulfill the exam, feel free to reach out to the staffs regarding your concern.
- If you have any questions, please post a private Ed or attend available Office Hours. Note that we are not allowed to provide specific help to answering the exam questions.

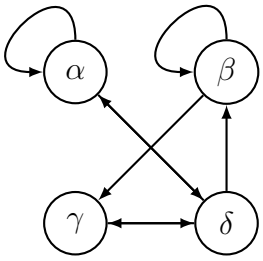
Name: _____ UCI NetID: _____

Problem 1 (R1)

What you need to show: Just provide an answer. There is no need to explain.
Consider the three main ways to represent a relation, as a set (using roster notation), as graph, and as a matrix. Each of the following relations is defined in one of those ways, pleases rewrite them in the representation specified by the part.

a) The domain of R is $\{0,1\}^3$. $(x,y) \in R$ if and only if x can be turned into y only by swapping any pairs of bits any number of times. Draw the graph representation of R.

b) The relation S is defined by the following graph, its domain is $\{\alpha, \beta, \gamma, \delta\}$.

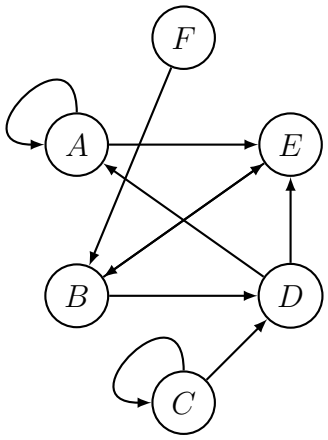


Please provide the relation S as a set using roster notation.

Name: _____ UCI NetID: _____

Problem 2 (R2)

What you need to show: For parts a-c just provide an answer. There is no need to explain. For part d, only provide justification for the choices you did not mark.



Using the graph above, answer the following questions:

a) What is the in-degree of B?

b) What is the out-degree of A?

c) List all the self loops in the graph (list each self loop with the only its vertex)

d) For the following state whether it is a walk, path, circuit, or cycle. (We are not testing on trail due to contradictory definitions in reading and lecture videos) Choose all that applies.

   (a) ⟨F, B, E, B⟩

   (b) ⟨A, E, B, D, A⟩

   (c) ⟨A, A, E, B, D, A⟩

   (d) ⟨D⟩

   (e) ⟨F, E, B, E⟩

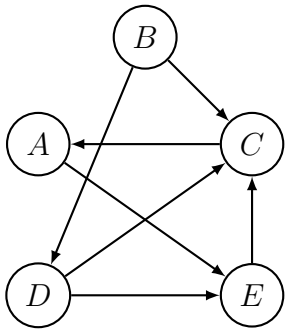
Name: _____ UCI NetID: _____

Problem 3 (R3)

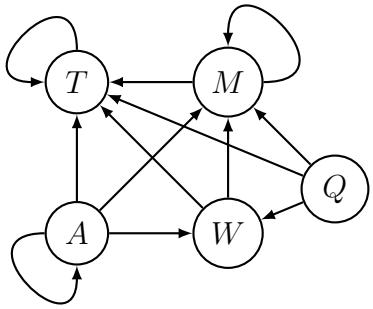
What you need to show: For each relation mark the properties it processes. Give three explanations, 1 for reflexivity/anti-reflexivity, 1 for symmetry/anti-symmetry, and 1 for transitivity. Each explanation can be 1 sentence. For property you don't mark you MUST give a counter example in the explanation box.

For each of the following relations determine if they are reflexive/anti-reflexive, symmetric/anti-symmetric, and transitive. Choose all that applies

a) Consider the following graph:



b) Consider the following graph:

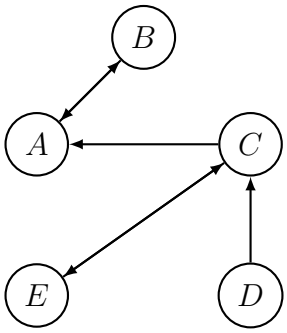


c) Consider the relation $E = \emptyset$ with a domain of $D = \{Happy, Sad, Confused, Angry\}$

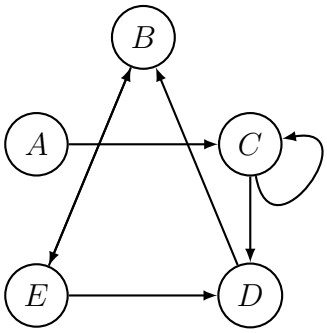
Name: _____ UCI NetID: _____

Problem 4.1 (R4)

What you need to show: Provide the composition as a graph. There is no need to explain.



The graph of F.



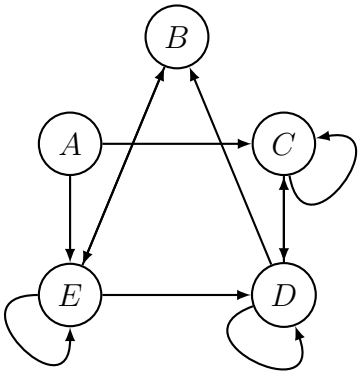
The graph of G.

Find the composition $G \circ F$.

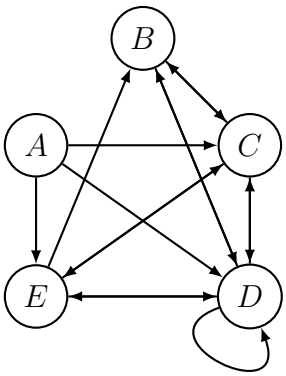
Name: _____ UCI NetID: _____

Problem 4.2 (R4)

What you need to show: Provide just an answer for each question. There is no need to explain.



Graph of G^2



Graph of G^3

Using the graphs above answer the following questions about G. Note you do NOT need to know about G nor can you find G. Any answer that attempts to find G will received a Not Yet.

a) How many vertices can reach the vertex C in a walk of length 2?

b) Starting at B how many vertices can be reached by a walk of length 5?

c) How many vertices can you start a closed walk of length 6 from?

d) There is a walk of length 5 from A to E, what is the third vertex in the walk? Note that A is the first vertex in the walk. The last vertex of a walk of length n is the (n+1)th, not the nth vertex.