CSC 411. Spring 2023

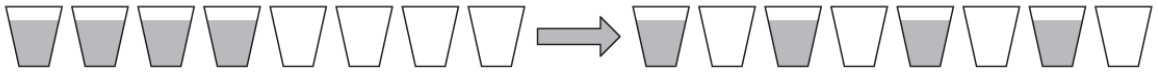
Homework #4

Due: Mar 14, 2022 (Tuesday) 11:59 pm

1. Textbook #4.1-2 (a) (b) (20 Points)

2. *Alternating glasses*

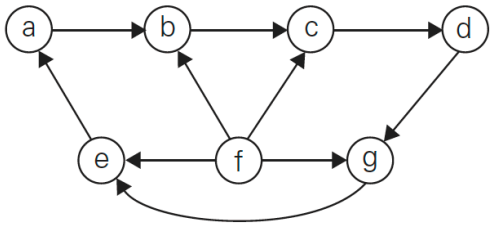
a. There are $2n$ glasses standing next to each other in a row, the first n of them filled with a soda drink and the remaining n glasses empty. Make the glasses alternate in a filled-empty-filled-empty pattern in the minimum number of glass moves. [Gar78]



b. Solve the same problem if $2n$ glasses—n with a drink and n empty—are initially in a random order.

2. Textbook #4.2-1 (b) & #4.2-5 (b) (20 Points)

1. Apply the DFS-based algorithm to solve the topological sorting problem for the following digraphs:



(b)

5. Apply the source-removal algorithm to the digraphs of Problem 1 above.

3. Textbook #4.3-2 (a-c) (30 Points)

2. Generate all permutations of {1, 2, 3, 4} by
- **a.** the bottom-up minimal-change algorithm.
- **b.** the Johnson-Trotter algorithm.
- **c.** the lexicographic-order algorithm.

4. Textbook #4.3-7 & 8 (20 Points)

7. Write pseudocode for a recursive algorithm for generating all 2^n bit strings of length n.

8. Write a nonrecursive algorithm for generating 2^n bit strings of length n that implements bit strings as arrays and does not use binary additions.

5. Textbook #4.3-9(a) (10 Points)

9. **a.** Generate the binary reflexive Gray code of order 4.