CS 101 Fall 2020 - Quiz 2-B

9/24/2020 - 20 Minutes **Name:** **ID number:** **Score:**

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(1) (6 Points) Suppose you have a stack in which the values 1 through 5 must be pushed on the stack in that order, but that an item on the stack can be popped at any time. Give a sequence of push and pop operations such that the values are popped in the following order: (It might not be possible in each case)

(a) 2, 5, 4, 1, 3

(b) 1, 3, 5, 4, 2

(b) 3, 4, 5, 2, 1

Solution:

25413	13542	34521
push 1	push 1	push 1
push 2	pop	push 2
pop	push 2	push 3
push 3	push 3	pop
push 4	pop	push 4
push 5	push 4	pop
pop	push 5	push 5
pop	pop	pop
x	pop	pop
(not possible)	pop	pop

(2) (4 Points) Suppose there is an initially empty queue with capacity 7 which is implemented by an array (viewed circularly). Show the array after the following operations being operated and indicate the place of the front and back of the queue.

(1)
Enqueue(1)
Enqueue(2)
Enqueue(3)
Dequeue()
Enqueue(4)
Enqueue(5)
Enqueue(6)
Enqueue(7)
Enqueue(8)
Dequeue()
Enqueue(4)
Dequeue()

Solution:
8 4(back) □ 4(front) 5 6 7
1 1(back) □ □ □ □ 2(front)

(2)
Enqueue(1)
Enqueue(2)
Enqueue(3)
Enqueue(4)
Enqueue(5)
Dequeue()
Enqueue(3)
Enqueue(2)
Enqueue(1)
Dequeue()
Dequeue()
Dequeue()
Dequeue()
Enqueue(1)
Dequeue()

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(3) (10') Order the following functions so that for all i, j, if f_i comes before f_j in the order then $f_i = O(f_j)$. Do **NOT** justify your answers.

- $f_1(n) = 12$
- $f_2(n) = n^{\frac{1}{3}}$
- $f_3(n) = 3^n$
- $f_4(n) = 2^{\log_2 n}$
- $f_5(n) = n^3$
- $f_6(n) = n!$
- $f_7(n) = \log_2 n$
- $f_8(n) = 2^{\sqrt{n}}$
- $f_9(n) = \sqrt{n}$
- $f_{10}(n) = 2^n$

As an answer you may just write the functions as a list, e.g. $f_8, f_9, f_1, \cdots$

Solution: $f_1, f_7, f_2, f_9, f_4, f_5, f_8, f_{10}, f_3, f_6$