Middle East Technical University Department of Computer Engineering

CENG 310

Algorithms and Data Structures with Python

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Homework-05 Solution

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There is a one task solution for each page.

Task-1

R-6.8:

First operations cannot change the size. Only 10 of 15 dequeue operations can decrease the size. So, the answer is 32-10 = 22.

R-6.9:

Only dequeue operations can increase the *_front* instance. 10 needs to be added to *_front*. So, it depends on the initial array *_front* value. The formula for finding *_front* with capacity 30 is “(*initial*+10) % 30”. If initial *_front* value is 0 the result is 10. If the initial *_front* value is 22 the result is 2.

Task-2

Pseudo Code:

```
STACK_SEARCH(x, S, Q)
1   isFound = False
2   while not S.isEmpty()
3     if S.top() == x
4       isFound = True
5       break
6     Q.enqueue(S.pop())
7   counter = 0
8   while not Q.isEmpty()
9     counter = counter + 1
10    S.push(Q.dequeue())
11  for i: 1 to counter
12    Q.enqueue(S.pop())
13  for i: 1 to counter
12    S.push(Q.dequeue())
13  return isFound
```

Task-3

Pseudo Code for Enqueue Operation:

```
ENQUEUE(var)
1  S1.push(var)
```

Pseudo Code for Dequeue Operation:

```
DEQUEUE()
1  while not S1.isEmpty()
2    S2.push(S1.pop())
3  firstIn = S2.top() // firstIn = first in
4  while not S2.isEmpty()
5    S1.push(S2.pop())
6  return firstIn
```

It is sufficient to fill only *S1* for the Enqueue operation. However, the stack structure uses the first in last out methodology. For this reason, the stack of *S1* is completely emptied to *S2* to reach the first in element for dequeue operation. Now, the top variable from *S2* is the desired variable for the enqueue operation. That top variable is needs to be saved and then *S2* is emptied back to *S1*. Lastly, the saved variable should be returned.