

Data Structures and Algorithms

Comp 200

Fall 2022



Department of Computer Science
Forman Christian College University

Lab 6

Arrays: Lists, Strings and Multidimensional Arrays

DESCRIPTION	MARKS ALLOCATED
Attendance	25%
Task Completion	35%
Viva	35%
Submission	15%

Marks will be deducted in case if students have not completed the assigned task.

Note that these marks are max in each category. We may assign less than the given percentage of marks in case students have not successfully completed all the requirements.

This lab is time constrained. Please note that you must finish and submit your work within given time.

Question 1:

[Weightage: 25%]

Modify the experiment from below code fragment in order to demonstrate that Python's list class occasionally shrinks the size of its underlying array when elements are popped from a list.

```
import sys                                # provides getsizeof function
data = [ ]
n = 26
for k in range(n):                        # NOTE: must fix choice of n
    a = len(data)                          # number of elements
    b = sys.getsizeof(data) # actual size in bytes
    print('Length: {0:3d}; Size in bytes: {1:4d}'.format(a,
b))
    data.append(None)                      # increase length by one
```

Question 2:

[Weightage: 25%]

Caesar Cipher is a type of substitution cipher, in which each letter in the plain text is replaced by another letter at some fixed positions from the current letter in the alphabet.

For example, if we shift each letter by three positions to the right, each of the letters in our plain text will be replaced by a letter at three positions to the right of the letter in the plain text. For example if we encrypt the text HELLO WORLD using a right shift of 3, so the letter H will be replaced by K, E will be replaced by H, and so on. The final encrypted message for HELLO WORLD will be KHOOR ZRUOG.

A program is required to be implemented with forward and backward strings encryption using a combination of the join method and an appropriate comprehension syntax.

Question 3:

[Weightage: 25%]

Let's write a function that simulates shuffling of a deck of cards, you are required to store all the card faces in a list and generate random permutations of all list elements. To achieve our required purpose, we can use [Fisher–Yates shuffle Algorithm](#) for optimal performance.

Question 4:

[Weightage: 25%]

Use standard control structures to compute the sum of all numbers in an $n \times n$ data set, represented as a list of lists. Then describe how the built-in sum function can be combined with Python's comprehension syntax to compute the sum of all numbers in an $n \times n$ data set, represented as a list of lists.

