Master of Computer Applications
MCAC-101: Object Oriented Programming
Unique Paper Code: 223401101
Semester I
March-2021
Year of admission: 2020

Time: Three Hours   **Max. Marks: 70**

Notes:

1. Answer any **Four** questions. All questions carry equal marks.
2. You MUST document your code properly for full credit.

1.   a. The price of a single share of a company is stored in a list called **prices**. A person buys a stock of a particular company from the stock market, and then sells it (usually at a higher price, to earn profit) in the same week. A person can buy only one share of a company. There is only one week (5 days) during which transaction i.e., buying and selling must take place. A person can buy a share on any day of the week, and can sell on any day, provided (day of selling > day of buying) i.e., it is impossible that the person sells a share before buying it. Write a Python function to find out the *maximum profit (positive or negative)* that can be earned, during the given week, by a buyer.

      b. Write a Python function that takes two strings as arguments and determines if they are anagrams. (Ignore spaces, case, punctuation, or special characters). Note: Anagrams are the strings which are made up of the same set of letters. For example: **Mary** and **A r m,y** are anagrams.

2.   a. Write a recursive function **insert** which inserts the element **x** at every alternate position of a given list. For example, the function call **insert(lst,50)** where lst = ⌊1, 2, 3, 4⌋, will yield the list ⌊1, 50, 2, 50, 3, 50, 4, 50].

      b. Write a function that accepts a list of integers and a number **k**, and removes all occurrences of **k**. For example, if **k** =3, the list [1, 3, 12, 3, 24, 3], will yield the list ⌊1, 12, 24⌋. Do not use built-in functions.

3.   Write a Python function **encrypt** that takes a sentence as input from the user and returns the encrypted message using the following rules:
      uppercase alphabet is replaced with shift formula $(i+6)\%26$, where i is ASCII value of the alphabet, lowercase alphabet is replaced by $(i-3)\%26$, where i is ASCII value of the alphabet, a digit (0 to 9) is replaced by a character whose ASCII value is computed as $(square(digit)+5)\%26+65$, and a special character is

kept as it is. A space is added after each encoded letter/digit.

Also, design a function **decrypt** to decrypt the message.

4. A given list, say, `lst` is to be sorted using Selection sort algorithm. Assume that elements `lst[0]`, `lst[1]`, ..., `lst[k]`, have already been arranged (`lst[0]` being the smallest element of the list), write a recursive function **iteration** that accepts the list `lst` along with other suitable parameters to carry-out the next iteration of selection sort so that on execution of the function `lst[0]`, `lst[1]`, ..., `lst[k]`, `lst[k+1]` have been arranged.
Example: If k = 3, `lst` = [5, 7, 9, 64, 25, 12, 22, 11], on execution of the function **iteration**, the modified list should appear as: `lst` = [5, 7, 9, 11, 64, 25, 12, 22]

5. Write a class definition for a **Date** object that has attributes `day, month,` and `year.` Define another class **Employee**, having attributes name, date of hiring, and salary. For each class, define the appropriate constructor and __str__ functions, property decorator to get and set attributes. The class definition should keep track of total number of objects created for the **Employee** class.
Write a function that accepts an object of class **Employee** and the current date and returns an object **experience** that defines the total experience of the employee in the company in terms of the number of years, months and days. Note that object **experience** is of same data type as **Date**.

6. Create Python functions to reads the contents of a text file named **box.txt** containing information about the dimensions of geometric objects `cuboids` and `cones.` In this text file, the number of lines corresponds to the number of objects. Each row contains name of an object followed by its dimensions (length, breadth, and height for a cuboid and radius and height for a cone in this order).
For example, the file **box.txt** might appear as follows:
```
Cuboid 6 4 5
Cone 3 6
Cone 4 7
Cuboid 4 3 5
Circle 3
Cone 1 6
Cuboid 6 5 4
Cuboid 7 4 5
```

Write python functions for displaying graphically:
   a. Distribution of volume of all the cuboids in the form of a histogram
   b. A pie chart showing the number of cubes and cones
You should ignore any line that does not begin with **Cuboid** or **Cone.**