(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR THREE SEMESTER ONE

FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE

COURSE CODE : CSC 361E.

COURSE TITLE : GENERIC PROGRAMMING WITH PYTHON

DATE: 13/12/2022 **TIME:** 2.00 P.M. – 4.00 P.M.

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Assume the variable `dct` references a dictionary. Write an `if` statement that determines whether the key 'James' exists in the dictionary. If so, display the value that is associated with that key. If the key is not in the dictionary, display a message indicating so. [4 marks]

b) Given a list saved in a variable: `a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]`. Using list comprehension, write one line of Python that takes this list `a` and makes a new list that has only the even elements of this list in it. [3 marks]

c) Write a program that displays [2 marks]

```
Welcome to Python
Welcome to Computer Science
```

d) Average acceleration is defined as the change of velocity divided by the time taken to make the change, as shown in the following formula:

$$a = (v1 - v0) / t$$

Here, *v0* is the starting velocity in meters/second, *v1* is the ending velocity in meters/second, and *t* is the time span in seconds.

Assume *v0* is 5.6, *v1* is 10.5, and *t* is 0.5. Write the code to display the average acceleration

[1 marks]

e) Variables `i` and `j` each have associated values. Swap them, so that `i` becomes associated with j's original value, and `j` becomes associated with `i`'s original value [2 marks]

f) Given the variables `principal` and `divisor`, write an expression that computes the remainder of the variable `principal` when divided by the variable `divisor` [1 mark]

g) The dimensions (width and length) of room1 have been read into two variables: `width1` and `length1`. The dimensions of room2 have been read into two other variables: `width2` and `length2`. Write a single expression whose value is the total area of the two rooms. [2 marks]

h) Write a program that prompts the user to enter a four-digit integer and displays the number in reverse order. Here is a sample run: [4 marks]

```
Enter an integer: 5213

The reversal is: 3125
```

i) Assume that a variable `hoursWorked` has been initialized. Write a statement that assigns the value `True` to the variable `workedOvertime` if hoursWorked is greater than 40 and `False` otherwise. [2 marks]

j) Given the variables `x`, `y`, and `z`, each associated with an `int`, write a fragment of code that assigns the smallest of these to `min`. [3 marks]

k) Given the variables `sold_yesterday` and `sold_today`, write an `if/else` statement that compares `sold_yesterday` and `sold_today`, and based upon that comparison assigns `sales_trend` the value -1 (the case where `sold_yesterday` is greater than `sold_today`) or 1. [2 marks]

l) Write an expression whose value is the string that consists of the first four characters of string `s` [1 mark]

m) Assume that `sentence` is a variable that has been associated with a string consisting of words separated by single space characters with a period at the end. For example: "This is a possible value of sentence." Write the statements needed so that the variable `secondWord` is associated with the second word of the value of `sentence`. So, if the value of `sentence` were "Broccoli is delicious.", your code would associate `secondWord` with the value "`is`" . [3 marks]

QUESTION TWO [20 MARKS]

a. Write a program that reads some integers between 1 and 100 and counts the occurrences of each. Note that if a number occurs more than one time, the plural word "times" is used in the output. Note the integers are entered in one line separated by a space. Also note that the numbers are displayed in increasing order. [10 marks]

Sample Run

Enter integers between 1 and 100, inclusive: 2 5 6 5 4 3 23 43 2

```
2 occurs 2 times
3 occurs 1 time
4 occurs 1 time
5 occurs 2 times
6 occurs 1 time
23 occurs 1 time
43 occurs 1 time
```

b. Write a program that prompts the user to enter the number of students and each student's name and score, and finally displays the student with the highest score and the student with the second-highest score. Assume that the number of students is at least 2. [10 marks]

Sample Run

```
Enter the number of students: 5
Enter a student name: Barasa
Enter a student score: 60
Enter a student name: Achieng
Enter a student score: 96
Enter a student name: Kamau
Enter a student score: 85
Enter a student name: Susan
Enter a student score: 98
Enter a student name: Kibet
Enter a student score: 95
Top two students:
Susan's score is 98.0
Achieng's score is 96.0
```

QUESTION THREE [20 MARKS]

a. Write the following function that returns the location of the largest element in a two-dimensional list:

```
def locateLargest(a):
```

The return value is a one-dimensional list that contains two elements. These two elements indicate the row and column indexes of the largest element in the two-dimensional list. If there are more than one largest element, return the smallest row index and then the smallest column index. [7 marks]

b. Write a test program that prompts the user to enter a two-dimensional list and displays the location of the largest element in the list. Note that the matrix is entered by rows and the numbers in each row are separated by a space in one line. Here is a sample run:

Sample Run

```
Enter the number of rows in the list: 3
Enter a row: 23.5 35 2 10
Enter a row: 4.5 3 45 3.5
Enter a row: 35 44 5.5 11.6
The location of the largest element is at (1, 2)
```

[3 marks]

c. Write a program that uses a function whose header is given below to check whether two words are anagrams. Two words are anagrams if they contain the same letters. For example, silent and listen are anagrams. The header of the function is: [10 marks]

```
def isAnagram(s1, s2):
```

Sample Run 1

```
Enter a string s1: silent
Enter a string s2: listen
silent and listen are anagrams
```

Sample Run 2

```
Enter a string s1: split
Enter a string s2: lisp
split and lisp are not anagrams
```

QUESTION FOUR [20 MARKS]

a. Suppose that a text file contains an unspecified number of scores. Write a program that prompts the user to enter the filename and reads the scores from the file and displays their total and average. Scores are separated by blanks. Your program should prompt the user to enter a filename. [10 marks]

Sample Run

```
Enter a filename: scores1.txt
There are 24 scores
The total is 800
The average is 33.33
```

b. Consider the following lines from the text **Romeo and Juliet** with punctuations removed. Assume the lines are stored in a text file named `Juliet.txt`

```
But soft what light through yonder window breaks
It is the east and Juliet is the sun
Arise fair sun and kill the envious moon
Who is already sick and pale with grief
```

Write a program to count how many times each word appears in the file. First write Python code to prompt for the file name and open it for reading accounting for the case where the file does not exist. [10 marks]

QUESTION FIVE [20 MARKS]

a. Suppose there is a class `AirConditioner`. The class supports the following behaviors: turning the air conditioner on, off, and setting the desired temperature. The following methods are provided for these behaviors: `turn_on` and `turn_off`, which accept no arguments and return no value, and `set_temp`, which accepts an int argument and returns no value.

There is a reference variable `office_a_c` of type `AirConditioner`. Create a new object of type `AirConditioner` using the `office_a_c` reference variable. After that, turn the air conditioner on using the reference to the new object, and set the desired temperature to 69 degrees. **[3 marks]**

b. Write the definition of a class `Counter` containing:

- An instance variable named `counter` of type `int`
- An instance variable named `limit` of type `int`.
- A constructor that takes two `int` arguments and assigns the first one to `counter` and the second one to `limit`
- A method named `increment`. It does not take parameters or return a value; if the instance variable `counter` is less than `limit`, increment just adds one to the instance variable `counter`.
- A method named `decrement`. It also does not take parameters or return a value; if `counter` is greater than zero, it just subtracts one from the `counter`.
- A method named `get_value` that returns the value of the instance variable `counter`

[7 marks]

c. Write the definition of a class WeatherForecast that provides the following methods:

• An `__init__` method that initializes the following instance variables:

. An instance variable named `skies` should be assigned an empty string.

. An instance variable named `high` should be assigned the value 0.

. An instance variable named `low` should be assigned the value 0.

- A method named `set_skies` that accepts one argument, a `str`. The argument's value should be assigned to the instance variable `skies`.

- A method named `set_high` that accepts one argument, an `int`. The argument's value should be assigned to the instance variable `high`.

- A method named `set_low` that accepts one argument, an `int`. The argument's value should be assigned to the instance variable `low`.

- A method named `get_skies` that has no parameters and returns the value of the instance variable `skies`.

- A method named `get_high` that has no parameters and returns the value of the instance variable `high`.

- A method named `get_low` that has no parameters and returns the value of the instance variable `low`.

[10 marks]