PYTHON PROGRAMMING
(CSEN 2103)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) How to find the last element of list in Python? Assume 'bikes' is the name of list.
(a) bikes[0] (b) bikes[-1]
(c) bikes[lpos] (d) bikes[:-1]

(ii) Which function is used to shuffle a list in python?
(a) random.shuffle() (b) shuffle()
(c) random.list() (d) list.shuffle()

(iii) What will be the output of following code snippet?

```
def rec(L1):
    if not L1:
      return 1
    return L1[-1]*rec(L1[:-1])
L1=[1,2,3,4,5,6,7,8,9,10]
print(rec(L1))
```

(a) Infinite loop (b) Syntax error
(c) 362880 (d) 55

(iv) Which one of the following is a mutable data type?
(a) Tuple (b) string
(c) List (d) All of these

(v) What will be the output of the following code:

```
l1=[1,2,3]
l1.insert(2,25)
print(l1)
```

(a) [1,2,3,25] (b) [1,25,2,3]
(c) [1,2,25,3] (d) [25,1,2,3,6]

(vi) The metacharacter + in regular expression means
(a) Zero or more occurrences (b) One or more occurrences
(c) Exactly one occurrence (d) No occurrence

(vii) Find and write the output of the following python code:

```
a=10
def call():
    global a
    a=15
    b=20
    print(a)
call()
```

(a) 25 (b) 35
(c) 15 (d) 10

(viii) What will be the output of this code snippet?

```
import numpy as np
a=np.array([[1,2],[3,4]])
b=np.array([[5,6],[7,8]])
c=np.dot(a,b)
print(c)
```

(a) [[19, 22], [43, 50]] (b) [[5, 6], [7, 8], [1, 2], [3, 4]]
(c) [[1, 5], [2, 6], [3, 7], [4, 8]] (d) Error

(ix) Which of these options will match digits in a string?
(a) [0-9] (b) \D
(c) \d (d) a and c

(x) Which of the following option will the regular expression ^X-.*:[0-9.]+ match?
(a) X-DSPAM-Probability: Accurate (b) X-DSPAM-Confidence:0.8475
(c) X DSPAM-Confidence:0.53 (d) None of these

Fill in the blanks with the correct word

(xi) To define a block of code in Python language we use_____.

(xii) A _____ can be surrounded by three sets of single quotation marks or by three sets of double quotation marks.

(xiii) SciPy is a collection of mathematical algorithms and convenience functions built on _____.

(xiv) To create an identity matrix in NumPy we use _____method**.**

(xv) The expression 2**2 is evaluated as: _____.

Group - B

2. (a) With appropriate example to implement filter(), map and reduce() functions. *[(CO1)(Analyse/IOCQ)]*
(b) Write a class Point with data members x and y. Using __add__ method add two objects of the Point class. *[(CO1) (Understand/LOCQ)]*
(c) Write a python code to read every line from a text file named "in-data.txt" and copy them into a file "out-data.txt". If "in-data.txt" file does not exist through an exception. *[(CO1)(Remeber/LOCQ)]*

6 + 3 + 3 = 12

3. (a) "String is immutable"-Justify this statement. Write a python program, which input a string and ask user to delete a given word from the string. *[(CO1)(Understand/LOCQ)]*
(b) Which functions would you use to remove leading and trailing whitespaces from a given string? Give example for both. *[(CO1) (Remember/LOCQ)]*
(c) With example explain Identity operator and Membership operator. *[(CO2)(Apply/IOCQ)]*

(2 + 2) + 4 + 4 = 12

Group - C

4. (a) Explain the output from the following python code snippet:

```
str1="CSE students"
str2="HITK"
print(str1[:4])
print(str1*2)
print(str1[:-1]+str2+str1[-1]).
```

[(CO2)(Remember/LOCQ)]
(b) Write a python program to rotate the elements of a list such that the element at the first index moves to the second index, the element in the second index moves to the third index……., and the element in the last index moves to the first index. *[(CO2) (Analyse/HOCQ)]*
(c) What is the main advantage of using set as opposed to a list in python? *[(CO2) (Understand/LOCQ)]*
(d) Let there be a dictionary d={'Name': 'Rahul Sinha', 'Python': 85, 'DSA':52}
What will be the output when d.items() is executed? *[(CO2) (Remember/LOCQ)]*
(e) How we can implement packing and unpacking a tuple? Give example of each. *[(CO2)(Apply/IOCQ)]*

2 + 4 + 1 + 1 + 4 = 12

5. (a) Write a Python code using Regular Expression to check whether the password given by the user follows a set of rules.
(i) There must be at least 8 characters
(ii) There must be at least 1 small letter
(iii) There must be at least 1 capital letter
(iv) There must be at least 1 numeral
(v) There must be at least 1 special character
Take new password from the user with proper prompt. Display message to the user, depending on whether the password is correct or not. If incorrect, display the type(s) of errors. Compare the role of centralized control in traditional and distributed databases. *[(CO2)(Analyse/HOCQ)]*
(b) List out some common functions used in re module. *[(CO2) (Remember/LOCQ)]*
(c) What are the different steps to write a pythonic code? *[(CO2)(Remember/IOCQ)]*

6 + 3 + 3 = 12

Group - D

6. (a) Write a numpy program to find the union of two arrays. *[(CO3)(Remember/LOCQ)]*
(b) Why numPy arrays are faster than 'for' looping over lists in Python? *[(CO3) (Understanding/IOCQ)]*

(c) How is arr[:,1] different from arr[:,[1]]? Explain with example. *[(CO3)(Understand/HOCQ)]*

4 + 6 + 2 = 12

7. (a) Create the following using numpy arrays:
   (i) A 1-D array called zeros having 10 elements and all the elements are set to zero.
   (ii) A 2-D array called ones having 2 rows and 5 columns and all the elements are set to 1 and dtype as int.
   (iii) A 2-D array called myarray2 using arange() having 3 rows and 5 columns with start value=4, step size is 4 and dtype as float. *[(CO3)(Analyse/IOCQ)]*

   (b) Given two series S1 and S2

S2	
A	10
B	10
D	10
F	10

S1	
A	39
B	41
C	42
D	44

Find the output for following python pandas statements.

a. S1[: 2]*100
b. S1 * S2
c. S2[: : -1]*10

[(CO3) (Remember/LOCQ)]

(2 × 3) + (2 × 3) = 12

Group – E

8. (a) Write a tkinter program to display two buttons named as "Bob" and "Alice" and print a message "Hello Bob" when "Bob" button is clicked and "Hello Alice" when "Alice" button is clicked. *[(CO4)(Analyse/LOCQ)]*

   (b) **Plot the following data using a line plot:**

Day	1	2	3	4	5	6	7
Tickets Sold	2000	2800	3000	2500	2300	2500	1000

- Before displaying the plot display “Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday” in place of Day 1, 2, 3, 4, 5, 6, 7
- Change the color of the line to ‘Magenta’. *[(CO5) (Analyse/HOCQ)]*

   (c) Compare bar() and barh() functions . *[(CO5)(Apply/IOCQ)]*

4 + 6 + 2 = 12

9. (a) What will be the output of the following codes?
   (i)
```
import sympy
sympy.sqrt(8)
```
   (ii)
```
from sympy import symbols
x,y=symbols('x y')
expr=x+2*y
x*expr.
```
[(CO6)(Remember/LOCQ)]

   (b) Consider the dataframe ‘emp_df’

Name	Age	Salary
Shalini	25	32000
Gaurav	31	35000
Bhavya	29	37000
Divansh	28	27000

Write a python code to display a line graph with names on x-axis and age on y-axis. Give appropriate names for axis and title for the graph. *[(CO5)(Apply/IOCQ)]*

   (c) Compare pack() and grid() method in Tkinter. *[(CO4)(Apply/IOCQ)]*

(2 + 2) + 5 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	40.62	40.63	18.75

Course Outcome (CO):

After the completion of the course students will be able to
CSEN2103.1. Learn and understand the basics of the Python Programming Language.
CSEN2103.2. Learn about basic Python data structures.
CSEN2103.3. Learn about the NumPy and pandas libraries in Python.
CSEN2103.4. Learn about the GUI programming using Tkinter and Symbolic computing using SymPy.
CSEN2103.5. Learn about plotting and visualization using Matplotlib.
CSEN2103.6. Learn how to use SciPy for Equation Solving, Optimization, Interpolation, Integration and Ordinary Differential Equation
CSEN2103.7. Learn how to apply Python in building solutions to basic data analysis problems

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*