PROGRAMMING WITH PYTHON
(MCA1102)

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) Which of the following is not a built-in data type in Python?
(a) array (b) dict (c) set (d) tuple

(ii) What will be the output from the following Python code snippet?

```
a = [1, 2, 3]
b = a * 2
print(b)
```

(a) [1, 2, 3, 3, 2, 1] (b) [2, 4, 6]
(c) [1, 4, 9] (d) [1, 2, 3, 1, 2, 3]

(iii) How can you use range() to generate a sequence from 10 to 0 in steps of -2?
(a) range(10, 0, -2) (b) range(10, -1, 2)
(c) range(10, -1, -2) (d) range(10, 0, 2)

(iv) Which among the following does not support indexing?
(a) List (b) Tuple (c) Set (d) String

(v) How can you retrieve all the keys from a dictionary 'my_dictionary'?
(a) my_dictionary.keys() (b) my_dictionary.get_keys()
(c) my_dictionary.all_keys() (d) my_dictionary.keys_list()

(vi) What will be the output from the following Python code snippet?

```
college = 'HIT'
city = 'KOLKATA'
print(college[ :2] + city[4: ])
```

(a) ITATA (b) HIATA (c) HIKOLK (d) HITATA

(vii) Correct way of inheriting a derived class from a base class is
(a) class Base(Derived) (b) class Derived(Base)
(c) class (Base) Derived (d) class (Derived) Base

(viii) Which of the following statements is true about class methods in Python?
(a) They can only be called from instances of the class
(b) They can modify the class state but not the instance state
(c) They require the self parameter
(d) They can be called without creating an instance of the class.

(ix) What will be the output from the following Python code snippet?

```
import numpy as np
arr = np.array([[1, 2, 3, 4], [5, 6, 7, 8]])
print(arr[0:2, 2])
```

(a) [3 7] (b) [1 2 7] (c) [2 7] (d) [1 2 5 6]

(x) Which of the following is the most commonly used submodule of matplotlib for creating plots?
(a) matplotlib.plot (b) matplotlib.pyplot
(c) matplotlib.chart (d) matplotlib.pylab

Fill in the blanks with the correct word

(xi) The value of the expression 2 ** 2 ** 3 is _____.

(xii) Anonymous functions can be created with the _____ keyword.

(xiii) If a function does not have an explicit return value, the value returned by the function is _____.

(xiv) _____ inheritance allows a class to be derived from more than one base class.

(xv) The _____ function is used to list all the names defined in a module.

Group - B

2. (a) Explain the need for type conversion in Python with an appropriate example.
[(CO1)(Understand/LOCQ)]

(b) Write a Python script to print the following pattern, where the no. of rows is user input. It should only print the pattern if the user input is odd.
E.g. for no. of rows=7, the pattern is

```
*           *
*   *     *   *
*   *   *   *   *
*   *   *   *   *
*   *   *   *   *
*   *     *   *
*           *
```

[(CO3)(Apply/IOCQ)]]

(c) How does the 'else' block in a loop differ from an 'else' block in a conditional statement? Provide relevant examples to illustrate your explanation.
[(CO3) (Understand/LOCQ)]

3 + 5 + 4 = 12

3. (a) Evaluate the results of type casting between integers and strings in the following code. Discuss the differences in outcomes when casting between these types.

```
intValue = 123
strValue = "456"
result1 = intValue + int(strValue)
result2 = str(intValue) + strValue
```

[(CO1)(Analyse/IOCQ)]

(b) Workout the output from the following code snippet with explanation

```
for num in range(0,5,2):
    if num == 3:
        break
    print(num % 3)
else:
    print("Completed")
```

[(CO3)(Analyse/IOCQ)]

(c) Write a Python script that accepts an integer from a user, and checks whether that number is an Armstrong number or not. [An n-digit Armstrong number is an integer such that the sum of its digits each raised to the power n is equal to the number itself] *[(CO3)(Apply/IOCQ)]*

3 + 4 + 5 = 12

Group - C

4. (a) Differentiate between aliasing and cloning of lists with relevant examples. *[(CO2)(Analyse/IOCQ)]*

(b) What is a list comprehension in Python? Describe its syntax and provide an example that creates a list of squares for numbers from 1 to 5. *[(CO2)(Understand/LOCQ)]*

(c) The str.count() method counts the number of non-overlapping occurrences of a specified substring in a string. E.g., if myStr = 'Banana', myStr.count('an') returns 2, but myStr.count('ana') returns 1. Write a Python script that includes the overlapping cases also. *[(CO2)(Apply/IOCQ)]*

4 + 3 + 5 = 12

5. (a) Differentiate among positional only, positional/keyword and keyword only function parameters. *[(CO2)(Analyse/IOCQ)]*

(b) Explain tuple packing and unpacking in Python with relevant example(s). *[(CO2)(Understand/LOCQ)]*

(c) Use a dictionary to count the frequency of words in an input string. Only words should be counted, not blank spaces, numbers, or punctuation. Upper case should be considered the same as lower case. *[(CO2)(Apply/IOCQ)]*

5 + 3 + 4 = 12

Group - D

6. (a) What is the purpose of __init__() in a Python class? How does it differ from other methods? *[(CO4)(Understand/IOCQ)]*

(b) Define a base class 'Person' with an __init__ method, and a derived class 'Employee' that calls super().__init__ in its own __init__ method. Explain how super() helps in accessing the base class's methods and attributes. *[(CO4)(Apply/IOCQ)]*

(c) Explain the purpose of the 'try', 'except', 'else' and 'finally' blocks in Python with a suitable example. *[(CO4)(Understand/IOCQ)]*

4 + 4 + 4 = 12

7. (a) What is a module in Python? How do you import and use a module in a Python script? *[(CO4)(Understand/LOCQ)]*

(b) Why are __str__() and __repr__() used in Python class? Give an example to demonstrate the difference between __str__() and __repr()__. *[(CO4)(Understand/LOCQ)]*

(c) List three common exception types and mention when they occur. *[(CO4)(Remember/LOCQ)]*

4 + 5 + 3 = 12

Group - E

8. (a) Suppose, a NumPy array is created with the following statement:

```
import numpy as np
a = np.arange(-10, 10).reshape(4, 5) ** 2
```

(i) What will be the output from the following?

```
print(a)
print(a.ndim, a.shape, a.size, a.strides)
```

(ii) Extract all the numbers divisible by 3 or 5 from the array 'a' using a Boolean mask.

(iii) Replace all the numbers divisible by both 3 and 4 from the array 'a' with -1. *[(CO6)(Apply/IOCQ)]*

(b) What is the difference between using open() with the 'w' mode and the 'w+' mode? Provide scenarios where each mode would be useful. *[(CO5)(Understand/LOCQ)]*

8 + 4 = 12

9. (a) You are given a CSV file named 'sales_data.csv' that contains sales data with the following columns: Date, Product_ID, Quantity_Sold, and Price_Per_Unit. Write a Python script using the Pandas library to perform the following tasks:

(i) Load the CSV file into a DataFrame.

(ii) Calculate the total sales for each product (i.e., Quantity_Sold * Price).

(iii) Add a new column called Total_Sales to the DataFrame to store these calculated values.

(iv) Filter the DataFrame to include only those products that have total sales greater than Rs. 500.

(v) Save this filtered DataFrame to a new CSV file named 'filtered_sales_data.csv'. *[(CO6)(Apply/IOCQ)]*

(b) Write a Python script to copy the contents of one file to another. Ensure that your program handles exceptions if the source file does not exist or if there is an error writing to the destination file. *[(CO5)(Apply/IOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	30.21	69.79	0