

Roll No. : _____

CS1139: PROGRAMMING I

Duration: 3 hours

MM: 40

There are 4 questions in this paper with sub-parts. You have to attempt all questions. Make appropriate assumptions wherever required. Your Python code should have proper comments, indentation, variable names and handle all the valid and invalid test cases.

1. Write the output of the following python code snippets? Assume that there are no indentation or spacing errors in the code. (1x10 - COs 2, 3, 4, 5, 6)

(a) `l = list(range(1, 21))
print(l[::-3])`

(b) `x = "Object-Oriented-Programming"
L = x.split('e')
for i in L:
 print(i)`

(c) `N = 6
for i in range(N, 1, -1):
 for s in range(0, N-i):
 print(" ", end="")
 for j in range(i, 2*i-1):
 print("*", end="")
 for j in range(1, i-1):
 print("*", end="")
 print()`

(d) `l1 = list(range(1, 9))
l2 = list(range(10, 15))
mylst1 = [x**2 for x in l1 if x%2==0]
mylst2 = [x**3 for x in l1 if x%3==0]
l1.append(l2)
print(l1)
print(mylst1 + mylst2)`

(e) `a = "John Wick"
vowels = ["a", "e", "i", "o", "u"]
i = 0
while i < len(a):
 if a[i] in vowels:
 continue
 print(a[i])
 i+=1`

(f) `try:
 N = ["1.5", "0"]
 n1, n2 = int(N[0]), int(N[1])
 result = n1 / n2
 print(result)
except ValueError:
 print("Invalid input.")
except ZeroDivisionError:
 print("Cannot divide by zero.")
finally:
 print("Hello World!")`

(g) `d = {10: "ABC",
 20: "PQRS",
 30: "XYZ"}
for i in enumerate(d.items()):
 print(i)`

(h) `s = list("Harry Potter")
t = set(s)
print(len(t))`

```

(i) def rec(k):
    if(k > 0):
        result = k + rec(k-1)
        print(result, end=" ")
    else:
        result = 0
    return result

rec(5)

(j) class Animal:
    def msg(self):
        return("Can Move.")

class Vertebrate(Animal):
    def msg(self):
        return("Has a backbone.")

def main():
    creature = Vertebrate()
    print(Animal.msg(creature))
    print(isinstance(creature, Animal))

main()

```

2. (a) What does the following code compute for any two positive integer values?

(2 + 2 + 3 - COs 1, 2, 3, 4)

```

m = int(input("Enter a positive int "))
n = int(input("Enter a positive int "))
x, y = m, n
while True:
    if y>x:
        if x==0:
            break
        y, x = x, y-x
    else:
        if y==0:
            break
        x, y = y, x-y
    if x==0 or y==0:
        break
print("Result is : ", x)

```

- (b) Given an positive integer N , write a function that takes N and finds the the number of pairs (A,B) such that:

- $1 \leq A, B \leq N$ and
- $A + B$ is odd.

Sample Test Cases:

- For $N = 1$, Output is 0 since, there are no such pairs that can be formed.
- For $N = 2$, Output is 2 since, there are two pairs that can be formed (1, 2) and (2, 1).
- For $N = 3$, Output is 4 since, there are 4 pairs that can be formed (1, 2), (2, 1), (2, 3) and (3, 2).

- (c) Explain the steps of execution and determine the final output for the following piece of code?

```
def generate(lst):
    if len(lst) == 0:
        return []
    if len(lst) == 1:
        return [lst]
    l = []
    for i in range(len(lst)):
        m = lst[i]
        remLst = lst[:i] + lst[i+1:]
        for p in generate(remLst):
            l.append([m] + p)
    return l

data = list('abc')
for p in generate(data):
    print (p)
```

3. (a) What do you mean by inheritance in Object Oriented Programming? Give an example using Python? What are some of the types of inheritance?
- (b) Explain the difference between package and module. What are the different ways to import a module in a program?
- (c) Discuss various file opening modes with examples.
- (d) What are lambda functions ? Show how a lambda function can be used in a map() for a list of string values.

(2 x 4 - COs 3, 4, 5, 6)

4. Attempt all questions. Write complete Python programs:

(5 x 3 - COs 1,2,3)

- (a) **Closest Pair of Points:** Given list of N points in a 2D plane (their x and y coordinate values), find the two points that are the closest, i.e., their euclidean distance is minimum. Take input from the user and display closest pair of points and their distance value.
- (b) **Equal Pairs:** Take an NxN square matrix as input from user (Do not use Numpy). Write the python code to find and display the number of pairs of rows and columns which are equal.

Example: For the following 4x4 matrix, the final output should be 2 as row 2 and column 2 are equal, row 3 and column 3 are equal.

```
4 2 2 3
2 0 4 5
2 4 4 5
8 5 5 1
```

(c) **Word Pattern:** Given a pattern and a string s , find if s follows the same pattern. Here follow means a full match, such that there is a bijection between a letter in pattern and a non-empty word in s . Specifically:

- Each letter in pattern maps to exactly one unique word in s .
- Each unique word in s maps to exactly one letter in pattern.
- No two letters map to the same word, and no two words map to the same letter.

Example:

- Input: pattern = "abba", s = "dog cat cat dog"

Output: True

Explanation: The bijection can be established as: "a" maps to "dog". "b" maps to "cat".

- Input: pattern = "abba", s = "dog cat cat fish"

Output: False