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| **Unique Paper Code** | : | 42341102 |
| **Name of the Course** | : | B.Sc. Prog./Mathematical Sc |
| **Name of the Paper** | : | BSCS01 Problem Solving Using Computers |
| **Semester** | : | I |
| **Year of Admission** | : | 2019 onwards |

**Duration:** 3 hours **Maximum Marks:** 75

**Instructions for Candidates:**

- All questions carry equal marks. Attempt any **Four** out of **Six** questions.
- All the coding/error/output statements are based on Python programming language.

1. Identify the errors in the following statements and rewrite them after removing the errors:

```
a) j = 10
   while j != 0:
     print("j =" j)
     j =- 1
b) For i in range(4,6):
c) 1 + "Hello"
d) if i =< 4:
e) True = 1
f) a = [16, 82, 39]
   print(A)
```

Which of the following are valid identifiers? Also mention the cause of violation if an identifier is invalid.

```
a) Range
b) 2Subjects
c) abc-1
d) NaN
e) No of elements
```

Write statements/code snippet for the following expression:

$$c = \sqrt{a^2 + b^2 - 2ab\cos\gamma}$$

2. Write a single `for` loop to display the following pattern for `n` number of rows (in the example below, the number of rows is 3).

```
$
$$
$$$
```

Write a program to read the names and marks of 10 students and store them in a dictionary. Also write the functions to perform the following:

- Print the maximum marks
- Calculate the average marks
- Find the number of students who have scored less marks than the average marks

3.
- Define a class `Employee` with the following specifications:
  - Data members:

    `EmpID`, `Name`, `Age`, `Department`, `Salary`
  - Methods:
    - Constructor to initialize the data members.
    - `setValues` method to assign values to the `Department` and `Salary` data fields
    - `__str__` method to display employee details

  Also write statements to:
  - Create an object for an employee 'Sunil' of 34 years who is working in the HR department drawing a salary of Rs.50,000/- with employee id as 123.
  - Display the details of the employee created in the statement above.
  - Invoke `setValues` method to update the department of 'Sunil' to Sales and set the salary to Rs.55,000/-.
  - Display employee details with new values.
- Write a function that accepts the name of a file and returns the number of lines and the characters in the file. The function should return -1 if the specified file does not exist.

4. What will be the output on the execution of the following code segments? Justify your answers.

a)
```
lst = [x * y for x in range(3, 9, 2) for y in range(3, 1, -1) if x * y % 3 == 0]
print(lst)
```

b)
```
import copy
list_1 = [10, 20, [30, 40], 50]
list_2 = copy.deepcopy(list_1)
list_2[3] = 70
list_2[2].append(60)
print(list_2)
print(list_1)
```

c)
```
str = "Computer Fundamentals"
print(str[10:2:-2])
print(str[5:-2:2])
```

d)
```
t = (1, 2, 3, 4, 5, 6)
for i in range(len(t) - 1):
    print("t[%d] = %d"%(i, t[i]))
```

e)
```
def fn():
    try:
        s = "Hello"
        print(s[10])
    except ValueError:
        print("Value error")
    except IndexError:
        print("Index error")
        raise ValueError("Some error")
    except:
        print("Default error")
    print("Out")

try:
    fn()
except ValueError as msg:
    print(msg)
```

5. Define a function `checkDivisors` that takes an integer `N` as an argument and returns `True` when the number of divisors of `N` is even, `False` otherwise. Define another function that takes an integer `num` as an input from the user and invokes `checkDivisors`. If `num` is a positive integer and displays the result, otherwise display the message `"Invalid Input"`.

Write statements to perform the following:

- create a set `S1` having `"Violet"`, `"Indigo"`, `"Blue"`, `"Green"`, `"Yellow"`, `"Orange"` and `"Red"` colors
- create a set `S2` having `"Cyan"` and `"Magenta"` colors
- add `"Yellow"` and `"Black"` colors to `S2`
- find colors that are common to both the sets
- find colors that are present in `S2` but not in `S1`
- find all the colors that are present in both the sets

6. Apply selection sort to arrange the elements of the following list in descending order:

```
lst = [12, 5, 2, 4, 17, 44, 7, 6, 9]
```

Show all the intermediate steps of each pass. Determine the number of passes to sort the entire list.

Define a function for linear search that accepts two arguments: a list `lst` and the element `ele` to be searched. Assume that `lst` can have duplicate elements. If `ele` is present in the list, the function should return a list of all the indices corresponding to `ele`, [-1] otherwise. For example, if the list is [24, 68, 68, 24, 14, 68] and 68 is to be searched then the function should return [1, 2, 5].