Indian Institute of Technology Jammu
End-Term Exam
Jan 2025.

Maximum Marks: 100 **Name:**

Duration: 150 Minutes **Student Id**

Instructions:

- Read the questions carefully and make sure that you understand them before starting to write your code.
- This examination paper consists of 14 pages, and you are required to write your answers directly in the provided spaces within the examination paper.
- Mobile phones and smart devices are strictly prohibited in the lab. Do not bring them with you.
- Cheating in any form will result in zero marks for the exam. Additionally, a penalty of minus 5 marks will be given.
- All the questions are self-explanatory, please don't ask any doubts.
- In this paper, the total questions are worth 105 marks, but the maximum achievable score is capped at 100.

  Total Marks (Q)=105, Maximum Marks Achievable (M)=100

  Here, M=min(Q,100).

Finally, stay calm and focused throughout the exam. Good luck!

Q1: Total 50 Marks

5 Marks

a) def fun1(s1, s2):

```
    temp = s1
    s1 = s2
    s2 = temp
    return s1, s2

def fun2(s1, s2):
```

5 marks

b) The output of the program below is:

```
def swap(x, y):
    return y, x

def Silly():
    if not hasattr(Silly, "i"):
        Silly.i = 0
```

```
    temp = s1[0]
    s1[0] = s2[0]
    s2[0] = temp

if __name__ == "__main__":
    str1 = "Hi"
    str2 = "Bye"

    str1, str2 = fun1(str1, str2)
    print(str1, str2)
    str1, str2 = ["Hi"], ["Bye"]
    fun2(str1, str2)
    print(str1[0], str2[0])
```

Output

```
        Silly.a = -3
        Silly.b = -6

    while Silly.i <= 4:
        Silly.i += 1
        if Silly.i % 2 == 1:
            continue
        Silly.a += Silly.i
        Silly.b += Silly.i

    Silly.a, Silly.b =
swap(Silly.a, Silly.b)
    print(f"a = {Silly.a}, b =
{Silly.b}")

Silly()
Silly()
```

Output

5 marks

c) Consider the following C program segment

```
s = "string"
length = len(s)
p = ""
```

5 marks

d) What will be the output of the following C program?

```
def f(x, py, ppz):
    ppz[0] += 1
    z = ppz[0]
```

```
        for i in range(length - 1):
            p += s[length - i - 2]

        print(p)
```

```
            py[0] += 2
            y = py[0]
            x += 3
            return x + y + z

        def main():
            c = [4]
            b = c
            a = [b]
            print(f(c[0], b, a[0]))

        main()
```

Output

Output

10 marks

e)

```
def find_min_index(arr, start, n):
    if start == n - 1:
        return start

    min_index = find_min_index(arr, start + 1, n)

    return start if arr[start] < arr[min_index] else min_index

def IITJammu(arr, start, n):
```

10 Marks

f)

```
def IloveIITJammu(arr, n):
    if n <= 1:
        return

    IloveIITJammu(arr, n - 1)

    last = arr[n - 1]
    j = n - 2
```

```
    if start >= n - 1:
        return

    min_index = find_min_index(arr, start, n)

    if min_index != start:
        arr[start], arr[min_index] =
arr[min_index], arr[start] + 2

    IITJammu(arr, start + 1, n)

def print_array(arr):
    result = ""
    for value in arr:
        result += str(value) + " "
    print(result.strip())

def main():
    arr = [64, 25, 12, 22, 11]
    print_array(arr)
    IITJammu(arr, 0, len(arr))
    print_array(arr)

main()
```

```
    while j >= 0 and arr[j] > last:
        arr[j + 1] = arr[j]
        j -= 1
    arr[j + 1] = last

def printArray(arr):
    for val in arr:
        print(val, end=" ")
    print()

arr = [12, 11, 13, 5, 6]
n = len(arr)

printArray(arr)
IloveIITJammu(arr, n)
printArray(arr)
```

Output	Output
5 marks G. def ultapulta(str, start, end): if start + 2 >= end: return str[start], str[end] = str[end], str[start] ultapulta(str, start + 1, end - 1) str = list("hello") print(" ".join(str)) ultapulta(str, 0, len(str) - 1) print(" ".join(str))	**5 Marks** H. def Interesting(n): print(n) if n <= 1: return n return Interesting(n - 1) + Interesting(n - 2) + Interesting(n - 2) n = 4 print(Interesting(n))

Output:	Output:

Q2: Write a ***recursive*** function that takes a sentence as input and reverses the order of words while keeping the words themselves intact. Assume words are separated by a single space. [10 Marks]

Test Case 1:

Input:
`"Hello World"`

Output:
`"World Hello"`

Q3: Write a ***Recursive*** program to take a string as input and count the frequency of specific character present in it. [10 Marks]

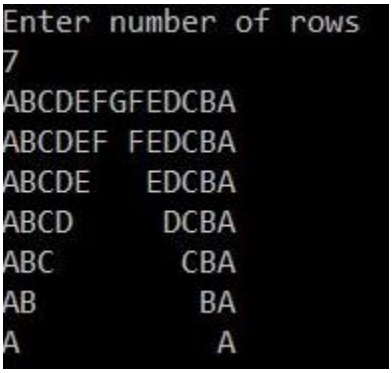
Test Case:

Input String: Dr. Sarada Prasad Gochhayat

Specific Character: a

Output: 7

Q4: Print the following patterns using a python program. [5 Marks]



Q5. Write a python program to print alphabets E and M using ‘*’ patterns. [10 Marks]

Q6. Write a recursive function to remove all repeated characters from a given string. Ensure the resulting string contains only unique characters. If you solve this problem without recursion, you will get 5 marks; with recursion, you will get 10 marks. [10 Marks]

Input:

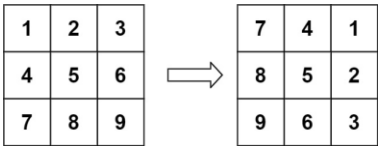
```
aabbccddeeffggh
```

Output:

```
abcdefgh
```

Q7. You are given a square $n \times n$ 2D matrix that represents an image. Your task is to rotate the image 90 degrees clockwise directly within the matrix. You must perform this operation in place, meaning that you cannot use an additional 2D matrix to achieve the rotation. The original matrix must be modified to reflect the rotated image. [10 Marks]

Input: `matrix = [[1,2,3],[4,5,6],[7,8,9]]`
Output: `[[7,4,1],[8,5,2],[9,6,3]]`



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