



Indian Association for the Cultivation of Science

(Deemed to be University under *de novo* Category)

Master's/Integrated Master's-PhD Program/Integrated Bachelor's-Master's Program/PhD Course

End-Semester Examination-Autumn 2022

Subject: **Introduction to Computing with Python**

Full Marks: 50

Subject Code(s): **MCS1101B**

Time Allotted: 3 h

Instructions (please read carefully each point)

- ★ Write as little as possible without missing out on any details
 - Think carefully before answering
 - There is no marks on being verbose
 - Sometimes, adding an example makes things easier
 - ★ There are **two sections** in the paper - (A) the **mandatory** section and (B) the **optional** section
 - ★ You can answer *any combination of questions* from the **mandatory Section A** as long as the total marks attempted is *less than or equal to 50*, i.e., any question attempted beyond 50 marks will not be considered while marking
 - ★ Additionally, you can attempt the **optional Section B** which contains *10 marks* in total; **this may be considered at the time of final grading but not for the End-sem exam itself**
 - ★ If you are making any valid assumption(s) while writing an answer, do remember to mention that information clearly and concisely
 - ★ 3 bonus marks will be awarded if there is *no minor mistakes* as well as *major ones*, and *questions worth a total of 50 marks are attempted*
 - ★ Consider all questions in the **section A are for C language** and **assume the size of *int* and *float* as 4 bytes, *char* as 1 byte, *double* as 8 bytes, *pointer types* as 8 bytes** for this exam; also note the characters are evaluated using their **ASCII** values **A-Z** are valued **65-90** and **a-z** are valued **97-122** respectively
 - ★ Questions marked with [Python] are all-or-nothing questions. For the rest, there will be part-marking.
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Mandatory Section A

Q1.1. **Mark 2**

Write a function that takes a string as input and prints it.

Q1.2. **Mark 2**

Illustrate using a minimal example the concept of recursion.

Q1.3. **Mark 2**

```
int arr[2][2][2];  
printf(“%d %d %d %d”, sizeof (arr), sizeof (arr[1]), sizeof (arr[1][0]), sizeof (arr[1][0][1]) );
```

Write down the output of the printf statement above.

Q1.4. **Mark 2**

```
struct new_type { int a; float b[3]; char name[10];}  
struct new_type n1;  
printf ( “%d %d”, sizeof(n1), sizeof(n1.name));
```

Write down the output of the printf statement above.

Q1.5. **Mark 2**

Create your own structure for storing points in a 4-dimensional space.

Q1.6. **Mark 2**

```
int fun(int* arr) {   printf (“in fun: %d\n”, sizeof (arr)); }  
int main()  
{ int arr[10];   printf (“in main: %d\n”, sizeof (arr)); fun (arr); }
```

Write the output of code above.

Q1.7. **Mark 2**

Give code to return the absolute value of an integer. e.g. both -5 and 5 become 5.

Q1.8. **Mark 2**

```
double arr[4];  
printf(“%p”, arr); ⇒ gives the output 0x1024
```

Calculate and write down the address of all the elements of the array arr.

Q1.9. **Mark 2**

Write a preprocessor(e.g. #define, #if, etc.) directive for getting the average of two values.

Q1.10. **Mark 2**

Write a simple code for opening and closing a file named “abc.txt” in write mode. *Just write the variable declaration(s) and the function call(s), no need to write #include, main, etc.*

Q1.11. **Mark 2**

Given a 2D coordinate position of a point, determine which quadrant the point is in. e.g. (-2,-2) is in the third quadrant, (2,3) is in the first quadrant.

Q1.12. **Mark 2**

Given an alphabet as input, check whether it is a vowel or a consonant.

Q2.1.**Mark 3**

```
void fun(int x, int y)
{
    if (x>y)
        fun(y+1, x-1);
    else if (x<y)
        fun(y-1, x+1);

    printf("%d %d\n", x, y);
}
```

Write the output when *fun(10,2)* is called.

Q2.2.**Mark 3**

Write a program/function to find the number of trailing zeros in a given factorial.

Example:

Input: 4 ⇒ Output: 0

Input: 10 ⇒ Output: 2

Input: 100 ⇒ Output: 24

Q2.3.**Mark 3**

```
float calc_avg (/*(A)formal parameter(s) for passing array*/);
int main ()
{
    float arr[] = {10.2, 10, 12, 11, 2, 3, 4, 9, 1, 2, 11.4, 2, 5, 19};
    int size = /*(B)write code for calculating number of elements*/;
    float avg = calc_avg(/*(C)pass the variable(s)*/);
}
```

Complete the above prototype and the corresponding function call for passing the array to the function. Just complete the A, B and C marked above. **Note:** You don't have to define the function, just assume it is already done.

Q2.4.**Mark 3**

Write a program/function to find the sum of the series $1!/(N-1) + 2!/(N-2) + 3!/(N-3) + 4!/(N-4) + \dots$ upto N-1 terms. Take N as input from user.

Q2.5.**Mark 3**

You have two arrays of integers, each of size 5. Write code to create another array of size 10 containing all the elements in an alternating fashion.

Example:

Array 1: 10, 12, 14, 16, 18

Array 2: 9, 11, 13, 15, 17

Resultant array: 10, 9, 12, 11, 14, 13, 16, 18, 17

Q2.6.**Mark 3**

Show how to allocate memory using Dynamic memory allocation by allocating memory for an integer array of size N. N is read as input from the user.

Q3.1.**Mark 5**

Write a program/function that takes a month number (1-12) for the year 2023 as input and prints the dates for the Saturdays and Sundays in the month.

Example:

input 2 \Rightarrow Output: 4 5 11 12 18 19 25 26

input 9 \Rightarrow Output: 2 3 9 10 16 17 23 24 30

Hint: You need to identify the start day for the month, and you can/may use a 2D array

Q3.2.**Mark 5**

Write a program/function that takes a string as input and prints the upper case version of the string. Do not use library functions.

Example:

Input: souMAdiP \Rightarrow Output: SOUMADIP

Input: it's a nice Day \Rightarrow Output: IT'S A NICE DAY

Input: 10 days \Rightarrow Output: 10 DAYS

Hint: loop, check for null characters, etc.

Q3.3.**Mark 5**

Write a C program to divide two integers (dividend and divisor) **without using** *multiplication(*)*, *division(/)* and *modulo division(%)* operator.

Example:

input: 10 5 \Rightarrow Output: 2

input: 101 6 \Rightarrow Output: 16

Q3.4.**Mark 5**

```
typedef struct complex
{
```

```
    float real;
```

```
    float imaginary
```

```
}Q;
```

Write a function that takes the two complex numbers (you can use the above structure) and prints the multiplied value in $x + yi$ format (check examples below, ignore 0s and treat 1i as i).

Hint: $(x+yi)*(a+bi) = (ax-by) + (ay+bx)i$

Example:

Input: 2 3 3 4 \Rightarrow Output: -6 + 17i

Input: 2 -3 3 4 \Rightarrow Output: 18 - i

Input: 1 2 1-2 \Rightarrow Output: 5

Input: 1 2 -2 -1 \Rightarrow Output: -5i

Optional Section B

- Q4.1.** **Mark 1**
[Python] Give an example of how to print a variable in python.
- Q4.2.** **Mark 1**
[Python] Give an example of how to do integer division in python. (e.g. $5 \div 2 = 2$)
- Q4.3.** **Mark 1**
[Python] Give an example of how to write a list of integers in python.
- Q4.4.** **Mark 1**
[Python] Give an example of how to assign a value in a dictionary.
- Q4.5.** **Mark 1**
[Python] Give an example of how to access list elements using negative indexes.
- Q4.6.** **Mark 1**
[Python] $A = [10, 12, 14, 16, 18, 20, 22, 24, 26, 28] \Rightarrow$ what is $A[1:8]$?
- Q4.7.** **Mark 1**
[Python] $A = [10, 12, 14, 16, 18, 20, 22, 24, 26, 28] \Rightarrow$ what is $A[1:7:2]$?
- Q4.8.** **Mark 1**
[Python] $A = [10, 12, 14, 16, 18, 20, 22, 24, 26, 28] \Rightarrow$ how do you reverse it?
- Q4.9.** **Mark 1**
[Python] Assume $x = \text{"Hi"}$ and $y = \text{"There"}$ \Rightarrow what will be $x+y$?
- Q4.10.** **Mark 1**
[Python] How do you calculate the length of the string "sly fox"?