



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
Mid-Semester Examination-Autumn 2023

Subject: Introduction to Computing
Full Marks: 25

Subject Code(s): MCS1101B
Time Allotted: 2 h

Instructions *(please read carefully each point)*

- ★ Write as little as possible without missing out on any details
 - Think carefully before answering
 - There are no marks on being verbose
 - Sometimes, adding an example makes things easier
 - ★ If you are making any valid assumption(s) while writing an answer, do remember to mention that information clearly and concisely
 - ★ For 1-mark questions, no explanations are required; just write the answers.
 - ★ For 3-mark questions, you can just write the reasoning for your answer
 - ★ For 4-mark questions, write full codes, minor mistakes (*missing a semicolon, forget to close a bracket, etc.*) are ok, major mistakes (*messing up syntax for a loop, switch case, incorrect function prototype, etc.*) are not, and will draw penalty.
 - ★ Consider all questions are for C language and assume the size of int and float as 4 bytes, char as 1 byte, double as 8 bytes, pointer variables as 8 bytes in 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
 - ★ **Attempt Any Five from Part A, Any Four from Part B and Any Two from Part C**
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Part A

Q1.1.

Mark 1

Which of the following are not valid variable name(s) in C language?
_, _name, 100%valid, while_for, roll-number, main, invalid

Q1.2.

Mark 1

Write the output of the following statement.
`printf ("Values = %d %d %f %f ", 8/3*3, 2+5/2%3-1, (float) (7/2), (float)7/2);`

Q1.3.

Mark 1

Write the output of the following code statement.
`printf ("Values = %d %o %x ", 527, 527, 527);`

Q1.4.

Mark 1

Write the output of the following code statement.
`int arr[4] = { 10,20,30,40};
int *iptr = &arr[1];
printf(“%p %p %p %d”, sizeof(arr), sizeof(*iptr), *(iptr+2), arr[2] - *iptr);`

Q1.5.

Mark 1

Write down the function prototype for which (you can choose any name for the function)

- The return type is a double pointer
- The parameters are as follows (in order): an array of integer variables, a floating-point value, a string and an address of some integer variable

Q1.6.

Mark 1

The declaration statement for an *array of character pointer variables with size 5* is written as: `char* arr_ptr[5];`
Calculate the value of `sizeof (arr_ptr)` and `sizeof (*arr_ptr)`.

Q2.1.**Mark 3**

Write down the output of the following code snippet (Collatz conjecture, 1937):

```
int y=12, count=0;
while (y != 1) {
    y = y%2 ? 3*y+1 : y/2 ;
    count++;
    printf("%d ", y);
}
printf("y = %d", count);           //calculate this output as your answer
```

Q2.2.**Mark 3**

Write down the output of the following code snippet:

```
int x = 10;
if (x = 1)           { printf ("1st if case: %d", x); }
if (--x)             { printf ("2nd if case: %d", x); }
else if (x == 1)     { printf ("else-if case: %d", x); }
else                 { printf ("else case: %d", x); }
```

Q2.3.**Mark 3**

Write down the output of the following code snippet:

```
int a[] = { 4, 1, 3, 2, 3 }, i=4, j;
i = --a[i];
j = a[++a[i] ] ;
printf ("%d,%d,%d", a[i], a[--j], sizeof(a)); //calculate this output as your answer
```

Q2.4.**Mark 3**

Write down the output of the function call Func (2,-3):

```
void Func (int n, int m) {
    printf ("\n %d %d", n, m);           //this line will generate required output(s)
    if (n==0 && m==0) return;
    if (n>0) return Func (m, n-1);
    if (n<0) return Func (m, n+1);
}
```

Q2.5.**Mark 3**

Write down the output of the following code snippet:

```
int x = 3;
switch (x++){
    default: x = 10;
                break;
    case 3:     x -= 2;
    case 100:   if( x== 1) { x = 30; } else { x = 40; }
                break;
    case 40: ++x;
}
printf("%d", x);           //calculate this output as your answer
```

Part C

Q3.1.**Mark 4**

Problem: Check if the sum of even numbers in an array is equals to the sum of the odd numbers in an array

Input: An integer array.

Output: Yes or No

Example:

[10, 13, 11, 14] → Yes

[11, 25, 27] → No

[0, 20, 15, 5, 10, 11, -1] → Yes

[-11, -20, -30, 0, 11, -23, -27] → Yes

Q3.2.**Mark 4**

Problem: Count the number of zero's in a given digit

Input: An integer value X.

Output: An integer

Example:

X = 100 → 2

X = -2000 → 3

X = 124 → 0

X = -10703 → 2

Q3.3.**Mark 4**

Problem: Check if the given input is part of some twin prime.

Definition of twin prime: Two numbers **x** and **y** are called twin primes if both x and y are individually prime numbers and the difference between **x** and **y** is exactly 2.

Input: An integer value X.

Output: Yes or No.

Example:

X = 11 → Yes

X = 17 → Yes

X = 12 → No

X = 23 → No