National University of Computer and Emerging Sciences

FAST School of Computing **Fall-2022** **Islamabad Campus**

CS-1002: Programming Fundamentals (CS)

Serial No:

Sessional Exam-II

Total Time: 1 Hour

Total Marks: 60

Thursday, 17th November, 2022

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Signature of Invigilator

Course Instructors

Dr. Aleem, Dr. Akhtar, Ms. Ifrah,
Mr. Sheheryar

_____	_____	_____	_____
Student Name	Roll No.	Course Section	Student Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use last page for rough work.
3. After asked to commence the exam, please verify that you have **ten (10)** different printed pages including this title page. There are a total of **3** questions.
4. Calculator is strictly prohibited.
5. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

	Q-1	Q-2	Q-3	Total
Marks Obtained				
Total Marks	**10**	**35**	**15**	**60**

Question 1 [5+5=10 Marks]

1.1: Consider the following C++ code and answer the questions below.

```
#include <iostream>
using namespace std;
int main() {
  const int N=3;
  int A[N]={3,2,1};
  int B[N]={0};
  for(int i = 0; i < N; ++i)
  {
    int length = 1;
    while (A[i] != 1) {
           if (A[i] % 2)
                A[i] = A[i] * 3 + 1;
           else
                A[i] /= 2;
           ++length;
     }
     B[i]= length;
   }
return 0;
}
```

a. What are the contents of array B when 1st iteration of for loop terminates.

B[0]	B[1]	B[2]
8	0	0

b. What are the contents of array B when 2nd iteration of for loop terminates.

B[0]	B[1]	B[2]
8	2	0

c. What are the contents of array B when 3rd iteration of for loop terminates.

B[0]	B[1]	B[2]
8	2	1

1.2: Consider the following C++ code and answer the questions below.

```
int get(int N)
{
    static int i = 0;
    return N-(i++) - 1;
}
int main()
{
    int SIZE = 10;
    int arr[] = {5,6,7,8,9,10,11,12,13,14};
    int j;
    for(int i=0; i < SIZE; i++)
    {
        j = get(SIZE);
        if (j==i)
            continue;
        arr[i] += arr[j];
        arr[j] = arr[i] - arr[j];
        arr[i] -= arr[j];
    }

    return 0;
}
```

a. What are the contents of array after 2nd iteration of for loop?

arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]	arr[7]	arr[8]	arr[9]
14	**13**	**7**	**8**	**9**	**10**	**11**	**12**	**6**	**5**

b. What are the contents of array after for loop terminates?

arr[0]	arr[1]	arr[2]	arr[3]	arr[4]	arr[5]	arr[6]	arr[7]	arr[8]	arr[9]
5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**

Question 2 [5+2+3+5+5+5+5+5= 35 Marks]

For the following questions, write the output of the program in the given box. In case of no output write **NO Output with the reason (No marks without mentioning the reason).**

```
int list[5]={2,4,8,10,-1};
int nextList[5]={3,-1,0,1,-1};
int start = 2;
int Free = 4;
void magic(int val , int position){
    int start = ::start;
    for(int i = 0 ; i< position - 1 ; i++)
        start=nextList[start];
    list[Free]=val; nextList[Free]=nextList[start];
   nextList[start]=Free++;
}
void magic(){
    int start = ::start;
    while(start != -1){
        cout<<list[start]<<"->";
        start=nextList[start];
    }
    cout<<"*"<<endl;
 }
 int main()
{
    magic();
    magic(5,2);
    magic();
    return 0;
 }
```

Output:

8->2->10->4->*
8->2->5->10->4->*

Each line 2.5 marks
Correct output at correct place

C++ Program	Output

`float calc(int y, int x) {`
`  return (y + x + 7.0 / 2);`
`}`
`int main()`
`{`
`  float i = 9.5;`
`  int j = 4.5;`
`  cout << calc(i, j) << endl;`
`}`
	16.5

`float x = 10;`
`while (x < 100) {`
`  int x = 20;`
`  x *= 5;`
`  x -= 10;`
`}`
`cout << x << endl;`
	No output. Infinite loop

`char text[] = "Hello WorlD";`
`int i = 0;`
`while (text[i] != '\0')`
`{`
`if (text[i] =='W'||text[i]=='H'|| text[i] == 'D')`
`  text[i] = '#';`
`  else if (text[i]>='a'&&text[i]<='z')`
`  text[i] -= 32;`
`  else if (i % 2 == 0)`
`  text[i] = text[i] - 1;`
`  else`
`  text[i] = '&';`
`  i++;`
`}`
`cout << text << endl;`
	#ELLO&#ORL#

`int MAX = 70;`
`for (char ch = 65; ch <= MAX; ++ch) {`
`  int i = 'A';`
`  while (true)`
`  {`
`  if (i++ % 2 == 0)`
`  continue;`
`  if (i > ch)`
`  break;`
`  cout << ch << " ";`
`  }`
`  cout << endl;`
`}`
	B
	C
	D D
	E E
	F F F

```
int x, y = 4;
    for (x = 2; x < y ; x+=2)
        y = y + 1 % x;
    cout << y << endl;
    x = y;
    do {
        cout << --x << endl;
        x *= 4;
    } while (x <= 10);
```

6
5

```
int i, j, sum = 10;
   for (i = 0; i<5; i++)
       if (i % 2)
           for (j = 0; j <= 3; sum += j++);
       else
           for (j = 3; j>0; sum += --j);
       cout << sum;
```

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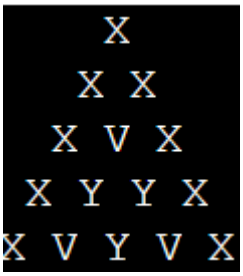
Note: correct output 5 marks

```
    int r=5,x=0;
    while(x<r){
        int y=1;
        while(y<r-x){
            cout<<" ";
            y++;
        }
        int z=0,n=1;
        while(z<=x){
      n= z==0 || x==0 ?  1  :  n*(x-z+1)/z;
char ch =  n==1 ? 'X'  :  n%3==0 ? 'Y' : 'V'
;

       cout<<ch<<' ';
            z++;
       }
        cout<<'\n';
        x++;
   }
```



Question 3 [5+5+5=15 Marks]

Complete the following C++ code by selecting the correct C++ statement or answer. Ambiguous selection will be treated as false.

Description:

Log base 2, also known as binary logarithm which is the inverse function of the power of two functions. The general logarithm states that for every real number n, can be expressed in exponential form as

$$n=a^x$$

Following function finds log base 2 of 32 bit integer

```
int log2(int x)
{
    int res = 0;
    while (x >>= 1)
        res++;
    return res;
}
```

a. x >>= 2

b. **x >>= 1**

c. x <<= 2

d. x <<= 1

e. x ~= 2

f. None of the above

Description:

Following functions checks if given integer is power of 2

```
bool isPowerof2(int x)
{
    return (x && !(x & x-1));
}
```

a. `(x && !(x && x-1))`

b. `(x || !(x || x-1))`

c. `(x & !(x & x-1))`

d. `(x | !(x && x-1))`

e. `(x && !(x & x-1))`

f. None of the above

Description:

Given an array arr[] of size N-1 with integers in the range of [1, N], the task is to find the missing number from the first N integers.
Note: There are no duplicates in the list.
Examples:
Input: arr[ ] = {1, 2, 4, 6, 3, 7, 8}, N = 8
Output: 5
Explanation: The missing number between 1 to 8 is 5

```
#include <iostream>
using namespace std;

int main()
{
    int arr[ ] = { 1, 10, 3, 7, 5, 6, 9, 2, 8 };
    const int N = sizeof(arr) / sizeof(arr[0]);

    int i;
    int temp[N + 1];
    N &= N;
    for(int i = 0; i <= N; i++){
      temp[i] = 0;
    }

    for(i = 0; i < N; i++){
      temp[arr[i] - 1] = 1;
    }


    int ans;
    for (i = 0; i <= N ; i++) {
        if (temp[i] == 0)
            ans = i  + 1;
    }

    cout <<ans<<endl;
}
```

a. arr[temp[i] - 1] = 1;

b. arr[temp[i] + 1] = 1;

c. temp[arr[i] - 1] = 1;

d. temp[arr[i] + 1] = 1;

e. None of the above

ROUGH WORK

Note: anything written on this page will not be marked.

ROUGH WORK

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