National University of Computer and Emerging Sciences

School of Computing **Fall 2018** **Islamabad Campus**

CS118
Programming Fundamentals

Wednesday, October 24, 2018

Course Instructor

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Serial No:

Mid Term

Total Time: 2 Hour
Total Marks: 75

_____
Signature of Invigilator

_____ _____ _____ _____
Student Name Roll No Section 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. Please read the complete paper before attempting any question and manage your time intelligently.
3. Additional sheet are provided for rough work at the end.
4. If you need more space write on the back side of the paper and clearly mark question and part number etc.
5. After asked to commence the exam, please verify that you have twelve (**12**) different printed pages including this title page. There are total of **6** questions.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
7. Use **proper indentation** while writing code and make sure that your code is legible. Failing to do so can cost you marks.

	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	**Total**
Marks Obtained							
Total Marks	20	15	10	10	10	10	**75**

Vetted By: _____Vetter Signature: _____

Question I ..…… (20 Marks)

Write the output produced by executing the following code? Please write proper explanation of the bug where required, without proper explanation no marks will be awarded. **[2 marks each]**

Code	Output
`int main( ) {` `  int x = 8, y = 0, z ;` `  while ( x >= 0 && y <=5 )` `  {` `  if ( x == y )` `  break ;` `  else` `  cout<<x<<y ;` `  x-- ;` `  y+=2 ;` `  }` `  return 0;` `}`	
`int main(){` `  const int U = 8, L = 2;` `  int n1, n2, n3 = 12, n4 = 3;` `  n1 = n3 > n4 ? n4 > U ? n3 : L : L;` `  cout << n1 << endl;` `  return 0;` `}`	
`int main(){` `char alphabet= 'A';` `for(int i = ('F'-'A'+1);  i >= 1; --i)` `  {` `  for(int j = 1; j <= i; ++j)` `  {` `  cout << alphabet << " ";` `  }` `  ++alphabet;` `  cout << endl;` `  }` `return 0;` `}`	

```
int main (){

   int x, y;
   x = 5;
   y = ++x * ++x;
   cout << x << y;
   x = 5;
   y = x++ * ++x;
   cout << x << y;
   return 0;
}
```

```
int main (){

  int z=1;
  for(int i = 5 ;i >= 1; --i)
    {
        z=i ;
        for(int z = 1; z <= i; ++z)
        {
            cout << z << " ";
        }
        ++z;

        cout << i << z<< endl;
    }
  return 0;
}
```

```
int main(){

  int x = 1, y =2, n=50 ;
  while (y <=n )
  {
      if ( n%y == 0 )
      { n=n/y;
        x=x+1;  }
    else
      {  y=y+1;  }
  cout<<x<<y;
  }
  return 0;
}
```

`` int main() { int x = 6, y = 7, z ; while (x >= 0) { while (y >=0) { cout<< y-- ; } cout<< x<<”\n” ; y=x-- ; } return 0; } ```	
`` int main(){ int suite = 5 ; switch (suite) ; { case 0+5 ; cout<< "\nClub" ; case 1+5 ; cout<< "\nDiamond" ; } return 0; } ```	
`` int main() { int a = 0, b=36; float f=3.9; b+= (a = 50)*f/3*10-b%5; cout << a << "$" << b; return 0; } ```	
`` int main() { float x = -10; while (x) { x *= 10; x += 10; } cout << x << endl; return 0; } ```	

Question II ……..…… (15 Marks)

a) (5 marks) Write a C++ program using if-elseif-else to input basic salary and allowances of an employee and calculate its Gross salary according to following:

Basic Salary <= 10000: HA = 20% of Basic Salary
Basic Salary <= 20000: HA = 25% of Basic Salary
Basic Salary > 20000: HA = 30% of Basic Salary

Gross salary is the final salary computed after the additions of *HA (House Allowance) into the Basic Salary.*

```
#include<stdio.h>

void main(void){

int basic;

printf("Enter basic salary to evaluate gross salary: \n");
scanf("%d", &basic);

int gross_salary = 0;

if(basic <= 10000){
    gross_salary = basic + (basic*20)/100;
    printf("Gross Salary on a Basic of %d will be: %d", basic, gross_salary);
}
else if(basic <= 20000){
    gross_salary = basic + (basic*25)/100;
    printf("Gross Salary on a Basic of %d will be: %d", basic, gross_salary);
}
else if(basic > 20000){
    gross_salary = basic + (basic*30)/100;
    printf("Gross Salary on a Basic of %d will be: %d", basic, gross_salary);
}

}
```

```
Enter basic salary to evaluate gross salary:
70000
Gross Salary on a Basic of 70000 will be: 91000
```

```
Enter basic salary to evaluate gross salary:
5000
Gross Salary on a Basic of 5000 will be: 6000
```

b) (2 marks) Write an input validation loop that asks the user to enter a number in the range of 10 through 25.

```c
#include<stdio.h>

void main(void){
    int x = 0;
    int number;

    while(x<1){
        printf("Enter a number between 10 to 25\n");
        scanf("%d", &number);
        if(number > 10){
            if(number<25){
                x = x + 2;
            }
        }
    }
}
```

```
Enter a number between 10 to 25
1
Enter a number between 10 to 25
87
Enter a number between 10 to 25
15

--------------------------------
Process exited after 41.54 seconds with return value 15
Press any key to continue . . .
```

a) (2 marks) Convert following code into if-elseif-else

```
char sport;
cin >> sport;
switch (sport)
{
   case 'c':
       cout << "You like Cricket";
   case 'f':
       cout << "You like Football";
       break;
   case 't':
   case 'H':
       cout << "You like Tennis";
       cout << "You like Hockey";
   case 'B':
       cout << "You like BasketBall";
       break;
}
```

```c
#include<stdio.h>

void main(void){
    char sport;
    printf("Enter sport: ");
    scanf("%c", &sport);

    if(sport == 'c'){
        printf("You like Cricket");
    }
    else if(sport == 'f'){
        printf("You like Football");
    }
    else if(sport == 't'){
        printf("You like Tennis");
    }
    else if(sport == 'H'){
        printf("You like Hockey");
    }
    else if(sport == 'B'){
        printf("Basketball");
    }
    else{
        printf("Nobody likes you!");
    }
}
```

b) (2 marks) Write a C++ program that find maximum value and the minimum value attained by f(x) =$x^2 + 3x + 2$ the interval [-9, 8].

If someone can explain me the Math for this, that would be really helpful!

c) (2 marks) Rewrite the following code in for loop?

```
int i = 3;
do {
        cout << "Hello World";
        i++;
        cout << i;
} while (i < 5 && i >= 2);
```

```
#include<stdio.h>

void main(void){
    int i = 3;
    for(i >= 2; i < 5; i++){
        printf("Hello World");
        printf("%d", i + 1);
    }
}

/*OUTPUT ------- HelloWorld4HelloWorld5*/
```

d) (2 marks) Point out the logical error in the following program and correct it.

```
int main()
{
   for (int i = 1; i <= 5; i++)
   {
        for (int j = 1; i <= 10; j++)
        {
            cout<<"*";
        }
     cout<<"\n";
    }
}
```

The program will run in an infinite loop because the nested for loop has the counter variable for the outer loop i. It should be converted to j in order for the program to work as intended. i will always be less than 10 and hence the infinite loop.

Question III …… (10 Marks)

Write a C++ program to check whether a triangle is a right angle triangle or not.

Note: In any right triangle, sum of square of two sides is always equal to the square of third side.

```
#include<stdio.h>

void main(void){
    int sidea = 5;
    int sideb = 12;
    int sidec = 13;

    if(sidea*sidea == sideb*sideb + sidec*sidec){
        printf("The triangle is a right-angled triangle");
    }
    else if(sideb*sideb == sidea*sidea + sidec*sidec){
        printf("The triangle is a right-angled triangle");
    }
    else if(sidec*sidec == sidea*sidea + sideb*sideb){
        printf("The triangle is a right-angled triangle");
    }
    else{
        printf("This is not a right-angled triangle");
    }
}
```

```
The triangle is a right-angled triangle
--------------------------------
Process exited after 0.03446 seconds with return value 39
Press any key to continue . . .
```

Question IV …… (10 Marks)

The value of a function F is defined by following infinite series:

$$F = \frac{1}{3} - \frac{x^2}{9} + \frac{x^4}{27} - \frac{x^6}{81} + \frac{x^8}{243} \ldots\ldots$$

Write a C++ code that take input N (number of terms) and x as arguments and calculates the function's value. In other words, calculate the sum of the series for first N terms. For example if N=5 and x=2 then it should display 0.744856.

```
Enter number of terms: 5
Enter the value of x: 2

0.744856
```

```c
#include<stdio.h>
#include<math.h>

void main(void){
    int count;
    int N;
    int x;

    printf("Enter number of terms: ");
    scanf("%d", &N );
    printf("Enter the value of x: ");
    scanf("%d", &x );

    float sum = 1.0/3.0;
    float local = -(pow(x,2))/9;

    for(count = 1; count<N; count++){
        sum = sum + local;
        local = local * (-pow(x,2)/3);

    }

    printf("\n%f", sum);

}
```

Question V..... (10 Marks)

Write a program to print pyramid using numbers

For lines = 4

```
   1
  2 3 2
 3 4 5 4 3
4 5 6 7 6 5 4
```

For lines = 5

```
    1
   2 3 2
  3 4 5 4 3
 4 5 6 7 6 5 4
5 6 7 8 9 8 7 6 5
```

```c
#include<stdio.h>

void main(void){
    int outer_loop;
    int inner_loop;
    int local;

    int lines;
    printf("How many lines do you want to print?\n");
    scanf("%d", &lines);

    int space = lines;

    for(outer_loop=1; outer_loop<=lines; outer_loop++){
        local = outer_loop;

        for(inner_loop=1; inner_loop<=space; inner_loop++){
            printf(" ");
        }
        space--;

        for(inner_loop=1; inner_loop<=outer_loop; inner_loop++){
            printf("%d", local);
            local = local + 1;
        }

        local = local - 2;

        for(inner_loop=1; inner_loop<outer_loop; inner_loop++){
            printf("%d", local);
            local = local - 1;
        }

        printf("\n");
    }

}
```

```
How many lines do you want to print?
5
    1
   232
  34543
 4567654
567898765

--------------------------------
```


Do not waste time on this. This will be probably be taught before MIDS-2.

Question VI …… (10 Marks)

Write a C++ program that takes input of an amount from user and print the minimum number of notes (Rs. 500, 100, 50, 20, 10, and 5) required for the amount.

Input:
Input amount: 575

Output:

Total number of notes:
500: 1
100: 0
50: 1
20: 1
10: 0
5: 1
2: 0
1: 0

Code on Next Page

```
Enter amount: 575
Total number of notes:
500: 1
100: 0
50: 1
20: 1
10: 0
5: 1
2: 0 (Coin)
1: 0 (Coin)
--------------------------------
Process exited after 1.924 seconds with return value 83
Press any key to continue . . .
```

```c
#include<stdio.h>

void main(void){

int amount;

printf("Enter amount: ");
    scanf("%d", &amount );

int five_hund = 0;
int one_hund = 0;
int fifty = 0;
int twenty = 0;
int ten = 0;
int five = 0;
int two = 0;
int one = 0;

while(amount > 0)
    if(amount/500 >= 1){
        five_hund = five_hund + 1;
        amount = amount - 500;
    }
    else if(amount/100 >= 1){
        one_hund = one_hund + 1;
        amount = amount - 100;
    }
    else if(amount/50 >= 1){
        fifty = fifty + 1;
        amount = amount - 50;
    }
    else if(amount/20 >= 1){
        twenty = twenty + 1;
        amount = amount - 20;
    }
    else if(amount/10 >= 1){
        ten = ten + 1;
        amount = amount - 10;
    }
    else if(amount/5 >= 1){
        five = five + 1;
        amount = amount - 5;
    }
    else if(amount/2 >= 1){
        two = two + 1;
        amount = amount - 2;
    }
    else if(amount/1 >= 1){
        one = one + 1;
        amount = amount - 1;
    }

printf("Total number of notes:\n500: %d\n100: %d\n50: %d\n20: %d\n10: %d\n5: %d\n2: %d (Coin)\n1: %d (Coin)"
, five_hund, one_hund, fifty, twenty, ten, five, two, one);
```