IBA Institute of Business Administration Karachi
Leadership and Ideas for Tomorrow

CSE141 Introduction to Programming (Fall'19)
Midterm Examination

IBA FCS
Faculty of Computer Science

Max Marks: 50   *Time Allowed:* 2 hours

> *Answer the questions in the spaces provided on the question sheets.*
> Please give <u>clear</u> and <u>rigorous</u> answers.
> Be to the point. Show your work.

Name: _____   **ERP:** _____

Question:	Short Questions	Tracing	Debugging	Bill Generator	Append	Patterns	Total
Marks:	10	10	10	6	6	8	50
Score:							

Question 1: Short Questions..*10 marks*

(a) [5 marks] Evaluate the following expressions. Show your work. If there is a syntax error, explain.

   i.   `double d = 10 + 4 * 8 - 6 / 2 ;`   ....
                         ....

   ii.   `int i = 16 % 5 ;`   ....
                         ....

   iii.   `int i = (int)round(1 + 1/2 + 1/4);`   ....
                          ....

   iv.   `int i = pow(2, 3);`   ....
                          ....

   v.   `String s="Exams are fun".substr(7,17);`   ....
                          ....

   vi.   `String t = tointeger("12") + "3";`   ....
                          ....

(b) [5 marks] For each question below, circle the correct answer:

   i. TRUE FALSE   The value of `(sqrt(2.0)* sqrt(2.0)== 2.0)` is `true`.

   ii. TRUE FALSE   Indentation does not change the meaning of your code in C++.

   iii.i TRUE FALSE   Standard input (using `Scanner`) cannot be used in any program that uses command-line input.

   v. TRUE FALSE   If `a` and `b` are arrays of the same length, then the code `a = b` copies each element of `b` to the corresponding position in `a`.

   v. TRUE FALSE   The number of items in an array `a` is `a.length()-1`.

Question 2: Tracing...*10 marks*

For each of the following code fragments, determine the value that will be output. If there is no output or an error, explain briefly why.

(a)
```cpp
String str = "EasyPeasyLemonSqueezy";
for (int i = 1; i <= str.length(); i += 2)
   std::cout<<str[i];
```

....

(b)
```cpp
int lDigit, number = 7689, res=0;
do {   lDigit = number % 10;
       res = (res * 10) + lDigit;
       number = number / 10;
} while (number > 0);
std::cout<<res;
```

....

(c)
```cpp
int list[6] = {2, 18, 6, -4, 5, 1};
for (int i = 0; i < list.length(); i++) {
  list[i] = list[i] + (list[i] / list[0]);
  cout<<list[i] + " ";
   }
```

....

(d)
```cpp
for(int i = 9; i > 0; i--){
   for(int j = i; j < 9; j++)
      std::cout<<"-";
   for(int j = i; j > 0; j--)
   std::cout<<i;
   std::cout<<endl;
}
```

....

(e)
```cpp
int a[5] = {1, 3, 5, 7, 9};   int b[5] = {1, 4, 9, 16, 25};
for (int i = 0; i < a.length(); i++) {
   a[i] += b[b.length() - 1 - i];
   std::cout<<a[i] + " ";
}
```

....

Question 3: Debugging..*10 marks*

(a) [5 marks] The following method attempts to examine a number and output whether that number is prime (i.e., has no factors other than 1 and itself). A flag named `prime` is used. However, the *Boolean* logic is not implemented correctly, so the method does not always output the correct answer. In what cases does the method report an incorrect answer? Find the problem and change the code so that it will always output a correct result.

```
void main () {                             ........................................
 string args="423131";                     ........................................
 int n = tointeger(args[0]);               ........................................
  boolean prime = true;                     ........................................
 for (int i = 2; i<n; i++) {               ........................................
     if (n % i == 0)                        ........................................
        prime = false;                      ........................................
     else                                   ........................................
        prime = true;                       ........................................
 }                                          ........................................
  Std::coutout<<prime;                      ........................................
}                                          ........................................
```

(b) [5 marks] Complete the following method that prints true if the string given as command-line argument is a palindrome and false otherwise.

```
void main() {

    String str;

    Std::getline(cin,str);

     boolean palindrome =_____;

     int i = 0;

     int len =_____;  // length of str

     while (i <_____  &&_____) {

         if (str[i]_____  str[_____]) {

             palindrome =_____;
         }
         i++;
     }
    std::cout<<palindrome;
}
```

Question 4: Bill Generator..*6 marks*

Electricity is billed based on the number of kilowatt-hours (kWh) used by a customer. To determine how many kilowatt-hours are used by a customer, we find the difference between the meter reading of a customer from the previous month to the meter reading for the current month. For example, if the meter reads 15100 for the previous month and 16232 for the current month, the customer used $16232 - 15100 = 1132$ kWh. Note that a meter reading is always 5 digits, and the meter "wraps around" after 99999 back to 00000.

Once the reading is calculated, compute the charge for the customer based on the following table:

Kilowatt-Hours Used	Charge
Less than 1000	7 cents per kWh
1000-2500	$70, plus 5 cents per kWh for each kWh above 1000
More than 2500	$145, plus 3 cents per kWh for each kWh above 2500

Write a Java program that uses the two valid meter readings as integers from command-line (you may assume a meter reading of 00235 would be entered as 235). It should then print out the number of kilowatt-hours used and the charge for the user in dollars and cents. Do your computations using cents only and then display in dollars and cents when you're done. Sample output for two runs of the program:

```
Input: 15100 16232
You used 1132 kilowatt-hour(s).
Your bill is $76.60

Input: 99900 1
You used 101 kilowatt-hour(s).
Your bill is $7.07
```

```
 void main() {

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    }
}
```

Question 5: Append..*6 marks*

Write a program `Append.java` that given two integer arrays, create a new array that contains the result of appending the second array's values at the end of the first array. For example, if arrays `a = {2, 4, 6}` and `b = {1, 2, 3, 4, 5}` respectively, then your program should create a new array `c` containing `{2, 4, 6, 1, 2, 3, 4, 5}`.

```
void main() {
    int a[3] = {2, 4, 6};        // sample data
    int b[5] = {1, 2, 3, 4, 5};  // your program should work for any a and b
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```
    }
}
```

Question 6: Patterns ....*8 marks*

Given integer N, write **for** loops to print an N-by-N triangular patterns like the ones below.

(a)
```
1 * * * *
2 2 * * *
3 3 3 * *
4 4 4 4 *
5 5 5 5 5
```

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(b)
```
A
B B
C C C
D D D D
E E E E E
```

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