T.C.
İSTANBUL ÜNİVERSİTESİ
Mühendislik Fakültesi
Bilgisayar Mühendisliği Bölümü

Dersin Kodu: BIMU1052	**Dersin Adı: INTRODUCTION TO ALGORITHMS**
Dersin Öğretim Üyesi: Yrd.Doç.Dr. Özgür Can TURNA	**Sınav Türü:**
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Öğrenci Ad - Soyad:	**İmzası:**

1. (16p) Describe these terms with one sentence for computer programming and algorithms.

a. Complexity

Time complexity of an algorithm quantifies the amount of time taken by an algorithm to run as a function of the length of the input.

b. Scalability

Scalability is the capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged to accommodate that growth. For example, a system is considered scalable if it is capable of increasing its total output under an increased load when resources (typically hardware) are added.

c. Reliability

Reliability is an attribute of any computer-related component (software, or hardware, or a network, for example) that consistently performs according to its specifications.

d. Compiler

A compiler is computer software that transforms computer code written in one programming language (the source language) into another computer language (the target language).

2. (8p) What is the difference between Syntax Error and Semantic Error? How do Developer Environments help us to find them?

Syntax Error is relating to the typing mistakes of the programmer. Generally IDEs help programmers to solve the syntax errors and match all the grammar rules in related programming language.

Semantic Error is about the mistakes in the algorithm logic. It is hard for IDEs to find out the logical mistakes in written codes. Programmers must test and debug the written program to find out if there is any semantic error exist.

3. (15p) Write an algorithm to multiply positive **integers x** and **y** by using addition and subtraction only. (You can use Step By Step definition or Flow Charts or C++ Coding)

```
int adder_multiplier(int x , int y )
{
      int i , mult = 0;
      for( i= 0; i < y ; i++)
      {
            mult += x;
      }
      return mult;
}
```

4. **(20p)** Write Newton's algorithm to calculate the square root of a with error less than e**.** (You can use Step By Step definition or Flow Charts or C++ Coding)

HINT: $x = \sqrt{a}$ for a > 0, i.e. to solve $x^2 = a$. The algorithm starts with some guess $x_1 > 0$ and computes the sequence of improved guesses

$$x_{n+1} = \frac{1}{2}(x_n + \frac{a}{x_n})$$

The intuition is very simple: if x_n is too big (> $\sqrt{a}$), then a/xn will be too small (< $\sqrt{a}$), and so their arithmetic mean x_{n+1} will be closer to $\sqrt{a}$.

```
float mySqrt(float a , float e)
{
      float xn = 1 , xn_next = 0 , xn_prev = 0;
      do
      {
            xn_prev = xn;
            xn_next = 1.0 / 2 * ( xn + a / xn );
            xn = xn_next;
      while( abs (xn_next – xn_prev) > e );   // abs() absolute function in math library
      return xn_next;
}
```

5. **(15 p)** Find out and correct the mistakes in the following code segments.

a.
```
cin << d  << sayi ;
```
```
cin >> d >> sayi ;
```

b.
```
cout <<  (x ve y'nin carpimi << x * y << dir << endl;
```
```
cout <<  " (x ve y'nin carpimi" << x * y << "dir" << endl;
```

c.
```
ilkSayi + ikinciSayi = sayilarinToplami;
```
```
sayilarinToplami = ilkSayi + ikinciSayi;
```

d.
```
if (sayi <= enBuyuk)
      enBuyuk == sayi;
```
```
if (sayi > enBuyuk)
      enBuyuk = sayi;
```

e.
```
*/3 tamsayının en büyüğünü bulan program/* cout << "3 sayinin toplami :\n" ;
```
```
/*3 tamsayının en büyüğünü bulan program*/ cout << "3 sayinin toplami :\n" ;
```

6. (**10p)** Assume **x** and **y** are **float,** **j** and **k** are **integer** variables. Write the assigned value in each line. (If you think about a Syntax or Runtime Error write it in the box)

a. Compile Error
```
x = 3.0; y = 2.0;    j = 10;   k = 4;
j =   j / k + y;
```

b. 4
```
x = 3.0; y = 2.0;    j = 10;   k = 4;
x =   j / k + y;
```

c. 4.5
```
x = 3.0; y = 2.0;    j = 10;   k = 4;
x =   (float)j / k + y;
```

d. 4
```
x = 3.0; y = 2.0;    j = 10;   k = 4;
x =   (float)(j / k + y);
```

e. Runtime Error
```
x = 3.0; y = 2.0;    j = 10;   k = 4;
x =   j / k + ( y / ( y - j / k ) );
```

7. **(15p)** Which of the strings cannot be used as a variable name? Explain why in each choice

a. phone#
is special character can not be in a variable name.

b. 12345
Variable names can not start with numbers.

c. ice_cream
correct
d. 92_sayi
Variable names can not start with numbers.

e. sayi-degeri
- is an operator and can not be in a variable name.
f. int
int is a keyword, variable names must be differ from keywords.
g. Int
correct
h. int1
correct