

**Key**

*You may consult one 8.5x11 inch sheet containing any information about the material covered in this course. This sheet must be turned in attached to the exam. No other materials, written or otherwise, are allowed other than the copy of the exam you are using and a pen or pencil. All questions about the exam should be addressed to the instructor or a teaching assistant. All questions in the exam should be answered on the exam. Use only a blue or black pen or a dark (no. 2) pencil. (Note: The exam is divided into 100 points.)*

**I. True/False**

(9 points, 1 each) Indicate whether the sentence or statement is true or false.

- T 1. A control structure alters the normal sequential flow of control in a program.
- T 2.  $(7 + 8 \leq 15)$
- F 3. The expression  $(!(x > 10))$  is equivalent to the expression  $(x < 10)$ .
- F 4. Suppose P and Q are logical (i.e. Boolean) expressions. The expression  $P \parallel Q$  is false if either P is false or Q is false.
- T 5. Suppose P and Q are logical (i.e. Boolean) expressions. The logical expression  $P \&\& Q$  is true if both P and Q are true.
- F 6. Suppose  $\text{num} = 6$ . What is the value of the following expression?  
 $((!true) \parallel (\text{num} > 6))$
- T 7. Suppose  $x = 10$  and  $y = 20$ . What is the value of the following expression?  
 $((x \geq 10) \&\& (y \leq 20))$
- F 8. In C++, the expression  
 $('A' < \text{ch} < 'Z')$   
is equivalent to the expression  
 $(('A' < \text{ch}) \&\& (\text{ch} < 'Z'))$
- T 9. What is value of the expression  $(!(x < 0))$  if the value of x is 0?

**II. List Vaules**

(4 points) Suppose that  $X$  is a variable of type `int`. List all of the values of  $X$  that would make the following expression true.

$$((x \geq 0) \ \&\& \ (x \leq 10))$$

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**III. Write the output of the following code.**

(10 points, 2 each)

```
1. num = 4;
   if(num >= 5)
       cout<<num;
   else
       cout<<num + 5;
```

9

```
2. x = 5;
   if(x > 10)
       cout<<"Hello ";
       cout<<"There. "
   cout<<"How are you?"
```

There. How are you?

3. Write the output for each of the following two sets of code if variable *score* has a value of 90.

```
(i) if(score >= 90)
      grade = 'A';
      if(score >= 80 && score < 90)
          grade = 'B';
      cout << grade;
```

A

```
(ii) if(score > 90)
        grade = 'A';
      else
          if(score >= 80)
              grade = 'B';
      cout << grade;
```

B

```
4. num = 20;
   if(num <= 10)
   {
       if(num >= 0)
           cout<<"Num is between 0 and 10";
   }
   else
       cout<<"Num is greater than 10";
```

Num is greater than 10

```
5. beta = 2;
   switch(beta)
   {
       case 1 : alpha = 89;
       case 2 : alpha = 22;
       case 3 : alpha = 56;
       default : alpha = 34;
   }
   cout << alpha;
```

34
----

#### IV. Multiple Choice

(12 points, 2 each) Identify the letter of the choice that best completes the statement or answers the question.

- b 1. Which of the following is a valid int value?
- 46,259
  - 46259
  - 462.59
  - None of these
- b 2. The value of the C++ expression  $14 / 4 + 4.3$  is:
- 7
  - 7.3
  - 7.8
  - None of these
- d 3. What type of C++ statement(s) stores a value in a variable?
- input
  - output
  - assignment
  - Both an input statement and an assignment statement
- d 4. Given
- ```
int one;
double two;
long four;
```
- which of the following assignment statements are valid?
- $one = 7 * 3 \% 4;$
  - $2.3 + 3.5 = two;$
  - $four = (2 + 3);$
- Only (i) is valid
  - (i) and (ii) are valid
  - (ii) and (iii) are valid
  - (i) and (iii) are valid

B 5. Suppose one and two are double variables and the input is

10.5 30.6

After the statements

```
cin >> one;
cin >> two;
```

execute

- a. one = 10.5, two = 10.5
- b. one = 10.5, two = 30.6
- c. one = 30.6, two = 30.6
- d. none of these

c 6. Suppose that x = 25.67, y = 356.876, and z = 7623.9674. What is the output of the following statements?

```
cout.setf(ios::fixed, ios::floatfield);
cout.setf(ios::showpoint);
cout.precision(2);
cout << x << ' ' << y << ' ' << z << endl;
```

- a. 25.67 356.87 7623.96
- b. 25.67 356.87 7623.97
- c. 25.67 356.88 7623.97
- d. None of these

**V. Identifiers**

(8 points, 2 each) Put an X under Valid if the identifier is valid in C++ or put an X under Invalid if the identifier is invalid in C++.

| <u>Identifier</u> | <u>Valid</u> | <u>Invalid</u> |
|-------------------|--------------|----------------|
| a) summaCumLunch  | x            |                |
| b) LAYER_CAKE     | x            |                |
| c) 1984           |              | x              |
| d) _shorty_       | x            |                |

**VI. Data Types of Literals**

(8 points, 2 each) Write an appropriate data type next to each literal.

“Summer in Antarctica”

string

23456

int (or long)

‘?’

char

9823856.3488346

double (or float or long double)

**VII. Output**

(9 points) Write the output of the following code as it would appear on the monitor screen (i.e. on the correct line, too).

```
string a = "Phi", b = "Jama", c = "Spama";
cout << b << a << endl << endl << c;
```

|         |
|---------|
| JamaPhi |
| Spama   |

**VIII. Expressions and Data Types**

(10 points, 2 each) Evaluate the following expressions and write the answers next to each. You may write the answers that include fractions with numerator/denominator notation.

- $21 / 10$
- $21 \% 10$
- $21.0 / 10.0$
- $2 * 3 - 4 / 2$
- $2 * (3 - 4) / 2$

|     |
|-----|
| 2   |
| 1   |
| 2.1 |
| 4   |
| -1  |

**IX. Programming**

(30 points)

On the attached sheet, write a complete and correct C++ program that calculates and outputs the bill for a cellular telephone company customer. The company offers two types of service. These are:

Gold Service – the customer pays \$.0359 per minute but must pay a minimum of \$20 each billing

Dirt Service – the customer pays \$.359 per minute but has no monthly minimum

The program must input the customer's name, account number (letters and digits), service type and number of minutes to be billed. The program should output the customer's name, account number, service type, minutes billed and the amount the customer owes.

All input should have meaningful prompts. All output should have meaningful labels, i.e. no output floating in space. You do not have to pretend to compile and run the program, just write the C++ source code.

```
#include <iostream>
#include <string>

using namespace std;

const double GOLD_RATE = .0359;
const double GOLD_MIN = 20.0;
const double DIRT_RATE = .359;

int main()
{
    cout.setf(ios::fixed, ios::floatfield);
    cout.setf(ios::showpoint);
    cout.precision(2);

    string customer,
           account,
           service;
    double minutes,
           amount;

    cout << " Enter customer name: ";
    getline(cin, customer);
    cout << "Enter account number: ";
    cin >> account;
    cout << " Enter service type: ";
    cin >> service;
    cout << " Enter minutes used: ";
    cin >> minutes;

    if (service == "gold")
    {
        amount = minutes * GOLD_RATE;
        if (amount < GOLD_MIN)
            amount = GOLD_MIN;
    }
    else
        amount = minutes * DIRT_RATE;

    cout << " customer: " << customer << endl
         << " account: " << account << endl
         << " service: " << service << endl
         << " minutes: " << minutes << endl
         << "amount due: $" << amount << endl;

    return 0;
}
```