CS10003 Programming and Data Structures, Spring 2022–2023

Class Test 1

30–March–2023   06:30pm–07:30pm   Maximum marks: 30

Roll no: _____   **Name:** _____

$\left[\begin{array}{l}\textit{Write your answers in the question paper. Answer \underline{all} questions. All questions use the programming language C.}\end{array}\right]$

1. (a) Which of the following are valid variable names? Fill in the blanks with only Yes/No answers. No explanations are needed. **(3)**

`_rs579t` ____Yes____	`-rs579t` ____No____	`r_s579t` ____Yes____
`r-s579t` ____No____	`5_79rst` ____No____	`_579rst` ____Yes____

(b) You want to declare and initialize the following variables: an integer variable `z1` initialized to 0, another integer variable `z2` left uninitialized, a character variable **`mychar`** initialized to the new-line character, and a **constant** double-precision floating-point variable **`me`** initialized to 9.11×10^{-31} (the mass of an electron in kg). Write the variable declarations in the box provided below. All initializations mentioned above must be during the declaration. **(3)**

```
int z1 = 0, z2;
char mychar = '\n';
const double me = 9.11e-31;
```

(c) Let `a1`, `a2`, `a3`, and `a4` be four **`int`** variables storing the values $1, 2, 3, 4$, respectively. What are the values of the following four expressions for these values of the variables? Fill in the blank beside each expression. Write only the final answers. No need to show your calculations. **(2)**

`a1 + a4 / a3 * a2`	____3____
`a1 + a4 * a3 % a2`	____1____
`a1 + a4 % a3 * a2`	____3____
`a1 + a4 % a3 % a2`	____2____

(d) Let `a`, `b`, `c`, and `d` be **`int`** variables storing the values $10, 20, 30, 40$, respectively. At this point, you execute the following two statements. What will be the values of the four variables immediately after these statements? Write only the final answers. No need to show your calculations. **(2)**

```
b = a++;
d += (c -= b);
```

Fill in the following blanks with the correct answers.

`a = ` ____11____   `b = ` ____10____   `c = ` ____20____   `d = ` ____60____

2. (a) Suppose that **marks** is a variable of data type **int**. The following code snippet is supposed to print **A grade** if **marks** is at least 80 and at most 89; otherwise it should print **Not A grade**. Fill in the blanks below so that the program behaves correctly. **(2)**

```
if (!(( _____marks < 80_____ ) || ( _____marks >= 90_____ )))
    printf("A grade");
else
    printf("Not A grade");
```

(b) Consider the following code snippet.

```
int x = 5;
if (x = 0) printf("rhino");
else if (x > 0) printf("giraffe");
else printf("zebra");
```

What will be printed by this snippet?   _____zebra_____   **(2)**

(c) Consider the following program.

```
#include <stdio.h>
int main ()
{
    if (-5) printf("W"); if ('5') printf("X");
    else printf("Y"); printf("Z");
    return 0;
}
```

What will be the output of this program?   _____WXZ_____   **(2)**

(d) Consider the following two code snippets. Write the respective outputs of the snippets in the spaces provided.   **(2)**

```
int x = 10;
if ((x == 10) || (x = 100));
printf("x = %d", x);
```
What will be printed by this snippet?

x = 10

```
int x = 10;
if ((x == 10) && (x = 100));
printf("x = %d", x);
```
What will be printed by this snippet?

x = 100

(e) Suppose that the integer variable **j** holds the value 5. Then, the following code snippet is executed.

```
switch (j + 2) {
   case 9:  printf("A"); break;
   case 8:  printf("B");
   case 7:  printf("C");
   case 6:  printf("D");
   case 5:  printf("E");
   case 4:  printf("F");
   case 3:  printf("G");
   case 2:  printf("H");
   case 1:  printf("I"); break;
   case 0:  printf("JKLM");
   default: printf("NOPQ");
}
```

What will be printed by this code snippet?   _____CDEFGHI_____   **(2)**

3. (a) Suppose that you want to compute the sum

$$s(n) = \frac{1}{1} + \frac{3}{2} + \frac{5}{3} + \frac{7}{4} + \cdots + \frac{2n-1}{n}$$

as a floating-point (**double**) value. The user supplies n as an integer. You then write a loop that computes $s(n)$ for the given n. After the loop, you print the value of $s(n)$ computed by the loop. Fill in the blanks to complete the program below that computes $s(n)$. Assume that the user enters a positive integer as **n**. Use no variables other than **n** and **s**.   **(5)**

```
int main ()
{
    int n;
    double s;

    printf("Enter n: "); scanf( _____"%d", &n_____ );
    s = 0;                                          /* Initialize the sum s */

    while ( _____n > 0_____ ) {          /* Loop on n */

        s +=    (double)(2*n - 1) / (double)n    ;       /* Update the sum s */
        --n;
    }

    printf("The desired sum is ____%lf____\n", s);
}
```

(b) Consider the following two code snippets. Write the respective outputs of the snippets in the spaces provided. Assume that **p** and **q** are **int** variables. Write only the outputs. No explanations are needed.   **(2)**

```
p = 50;
q = 0;
while (p % 10) {
    --p;
    ++q;
}
printf("q = %d", q);
```

What will be printed by this snippet?

q = 0

```
p = 50;
q = 0;
do {
    --p;
    ++q;
} while (p % 10);
printf("q = %d", q);
```

What will be printed by this snippet?

q = 10

(c) Consider the following code snippet.

```
int x, y = 0, counter = 0;
for (x = 1; x <= 5; x++) {
    counter++;
    y -= 2;
    if (y % 6 == 0) {
        x += y;
        y = x;
    }
}
printf("counter = %d", counter);
```

Write (only) the output of this code snippet in the blank.   _____counter = 11_____   **(3)**