## NATIONAL UNIVERSITY OF SINGAPORE

**School of Computing**

MID-SEMESTER TEST

AY2011/2012 Semester 2

**CS1010 Programming Methodology**

6 March 2012 Time Allowed: **1 hour 30 minutes**

**INSTRUCTIONS**

1. This question paper contains **SIXTEEN (16)** questions and comprises **EIGHT (8)** printed pages, including this page.
2. Maximum possible score is **30 marks**.
3. An **Answer Sheet** is provided for you to write the answers. It comprises **TWO (2)** printed pages.
4. Answer **ALL** questions within the space provided in the **Answer Sheet**.
5. Write legibly with a pen or pencil.
6. This is an **Open Book** test.
7. Calculators are allowed, but no electronic dictionaries, laptops, PDAs or other computing devices.
8. Submit only the **Answer Sheet** at the end of the test. You may keep the question paper.
9. Do **NOT** look at the questions until you are told to do so.

**——— END OF INSTRUCTIONS ———**

**SECTION A (10 Multiple Choice Questions : 10 Marks)**

Each question has only one correct answer. Write your answers in the boxes provided on the **Answer Sheet**. Each correct answer deserves 1 mark and no penalty for wrong answers.

1. Suppose you are doing C programming on sunfire, a UNIX machine. Your program is buggy and when you execute it, it goes into an infinite loop. What should you press to terminate your program properly, and return back to command line?
2. Ctrl + a
3. Ctrl + c
4. Ctrl + z
5. Ctrl + v
6. Escape
7. What will be printed out (i.e., displayed) on screen by the following printf statement?

printf("14/5\n");

1. 2
2. 14/5
3. 2.8
4. 14/5\n
5. Compilation error.
6. After which of the following statements, variable i will hold value 9.8?
7. double i = 98/10;
8. int i = 9.8;
9. double i = 98/10\*1.0;
10. double i = 98/(double)10;
11. None of the above.
12. Assume that num is an int variable holding an odd value, which of the following expressions will be evaluated to be 1?
13. !num
14. num%2 ? 0 : 1
15. (num-1)%2 == 0
16. num / 2 == 0
17. None of the above.
18. What is the output of the following code fragment?

int x = 4321, y = 1;

switch (x/100%10)

{

case 4: y += 4; break;

case 3: y += 3; break;

case 2: y += 2; break;

default: y += 1; break;

}

printf("%d\n", y);

1. 1
2. 2
3. 3
4. 4
5. 5
6. What is the output of the following code fragment?

int a = 0, b;

b = a--;

if ( b != 0 && a/b != 0 )

b \*= a;

else

b++;

printf("%d %d\n", a, b);

1. -1 1
2. 0 1
3. -1 0
4. -1 -1
5. Runtime divide-by-zero error.
6. What is the purpose of the following code fragment?

int i = 0, input, what = 0;

do {

printf("Enter an integer: ");

scanf("%d", &input);

if (what < input)

what = input;

i++;

} while (i < 5);

printf("%d\n", what);

1. Read in 4 integers and print out the smallest one.
2. Read in 4 integers and print out the biggest one.
3. Read in 5 integers and print out the biggest one.
4. Read in 6 integers and print out the biggest one.
5. None of the above.
6. Given the function definition what as follows,

void what(int \*ptr1, int \*ptr2)

{

int \*temp = NULL;

temp = ptr1;

ptr1 = ptr2;

ptr2 = temp;

}

What is printed out by the following code fragment?

int num1 = 5, num2 = 11;

int \*ptr1 = &num1, \*ptr2 = &num2;

what(ptr2, ptr1);

printf("%d %d %d %d\n", \*ptr1, \*ptr2, num1, num2);

1. 5 11 5 11
2. 11 5 11 5
3. 5 11 11 5
4. 11 5 5 11
5. None of the above.
6. What is the output of the following code fragment?

int i, j, k, x=0;

for(i=5; i>0; i--)

for(j=i; j<10; j++)

for(k=1; k<64; k\*=2)

x++;

printf("%d\n", x);

1. 210
2. 245
3. 270
4. 315
5. None of the above.
6. Examine the following code fragment to invoke function f:

int x = 4, a[6] = {5}, b[] = {1, 2, 3}, \*p = b;

f(x, a, p);

Which of the following could be a valid function prototype for function f?

1. void f(int, int [], int \*);
2. int f(int, int [], int \*);
3. void f(int, int \*, int \*);
4. void f(int, int [], int []);
5. int f(int, int [], int []);
6. i only
7. i, ii and iii only
8. i, iii and iv only
9. i, ii, iv and v only
10. None of them would result in compilation warning or error.

**Section B: Short Structured Questions (12 Marks)**

Write your answers in the space provided on the **Answer Sheet**.

1. The following program is to check whether a user has correctly guessed a secret number. However, it will receive compilation warnings and errors from gcc. [2 marks]

|  |  |
| --- | --- |
| 1  2  3  4  5  6  7  8  9  10  11  12  13  14  15 | #include "stdio.h"  int main(void)  {  int guess, secret = 1024;    scanf("%d", guess);  if (guess = secret)  printf("Wow, you got it!\n");  else  printf("Hmm, you missed: %d\n", secret);  RETURN 0;  } |

Identify all the 4 problems in the above program by pointing out the line numbers and giving correct statements.

1. What is the output of the following program? [3 marks]

|  |
| --- |
| #include <stdio.h>  #define N 5  int main(void)  {  int i;  int a[N] = {1, 3, 2, 4};  int b[ ] = {0, 2, 1, 3};  printf("%d", a[N-1]);  for (i=0; i<N-1; i++)  printf(" %d", a[b[i]]);  printf("\n");  return 0;  } |

1. What is the output of the following program? [3 marks]

|  |
| --- |
| #include <stdio.h>  int main(void)  {  int x = 100, i = 0, j;  do {  for (j = 0; j < 100; j++)  if ( !(j%2) )  x += j;  else  x += j-1;  } while (i++ < 10);  printf("%d %d\n", x, i);  return 0;  } |

1. What is the output of the following program? [4 marks]

|  |
| --- |
| #include <stdio.h>  int f1(int, int \*);  void f2(int \*);  int main(void)  {  int x = 20, y = 10;  y += f1(x, &y);  printf("%d %d\n", x, y);  return 0;  }  int f1(int x, int \*y)  {  x++;  f2(y);  return x + \*y;  }  void f2(int \*x)  {  while (\*x < 300)  \*x \*= 4;  } |

**Section C: Short Programming Questions (8 Marks)**

Write your answers in the space provided on the **Answer Sheet**.

1. Without using any selection construct (i.e., if, if-else, switch, and ?: operator), rewrite the following code fragment. [2 marks]

|  |
| --- |
| if (a)  return 1;  else if (b)  return 0;  else if (c)  return 1;  else  return 0; |

1. Given an array of n distinct integers (n>1), write a function find\_kth\_largest to return the kth largest integer (1 ≤ k ≤ n) in the array.

For example, a function call on array {3, 9, -1, 4, 0, -9, 2} for the 2nd largest number will return 4, while another call on the same array for the 4th largest number will return 2.

Note that:

1. You are not allowed to create any other array.
2. Marks will be deducted on complex design.

[6 marks]

|  |
| --- |
| // pre-condition: n > 1, 1 ≤ k ≤ n,  // all integers are distinct  int find\_kth\_largest (int list[], int n, int k)  {  // design your algorithm before coding!  } |

**=== END OF PAPER ===**