

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR
Department of Computer Science & Engineering
Programming and Data Structures (CS11001)
Class Test-I (Autumn, 1st Year)

Place: V-1, V-2, V-3, V-4, F-141, S-301, S-302
Time: 07:00-08:00pm

Date: Tue, Aug 30, 2011
Students: 660
Marks: 25

Answer ALL the questions.
Do all rough work on separate rough sheets which you should not submit.
Answer on the question paper itself in the spaces provided.

Roll no: _____ Section: _____ Name: _____

1. Answer the following questions in the given spaces:

(a) What values does the following code print?

```
int m = 7; int n = 9;
m += n; n = m - n; m = m - n;
printf ("%d, %d\n", m, n);
```

9, 7

1

(b) What values does the following code print?

```
int a = 7; int b = 4; int c = -2;
a = a - a % b * c;
printf ("%d\n", a);
```

13

1

(c) Let the variables in the code be defined as: `int a = 5; int b = -3; int c = 0;`
Which of the following conditions evaluates to true in the 'C' programming language?

- i. `(a < b) || (c < b)`
- ii. `(c < a) && (c < b)`
- iii. `(a > b) && !c`
- iv. `!(a + b > c)`

iii.

1

(d) Which of the following conditions is equivalent to the condition: `!((x >= y) && (y >= z))`?

- i. `!(x >= z)`
- ii. `x <= z`
- iii. `(x < y) && (y < z)`
- iv. `(x < y) || (y < z)`

iv.

1

(e) What values does the following code print?

```
int i;
for ( i = 0; i < 100; i = i + 3 );
printf ( "i = %d\n", i );
```

102

1

(f) What values does the following code print?

```
#define SNUM 10+10
int pNum = SNUM * SNUM;
printf ( "pNum = %d\n", pNum );
```

120

1

(g) What values does the following code print?

```
int k; int num = 30;
k = num > 5 ? (num <= 10 ? 100:200):500;
printf ( "k = %d\n", k );
```

200

1

(h) What is the output of the following code?

```
do {
    while (0) printf ("0\n");
    printf ("1\n");
} while (0);
```

1

1

(i) The 2's complement 8-bit binary representation of -57 is:

11000111

1

(j) The sum of the two 2's complement 8-bit binary numbers 00010001 and 11100101 in decimal is:

-10

1

2. Given below is a program to find the second largest of **TOTAL** (≥ 2) integers. You are required to fill up the parts of the code that are left blank so that the overall code has the required functionality.

```
#include <stdio.h>
#define TOTAL 1000
int main () {
    int i, num, max1 /* largest */, max2 /* second largest */;
    scanf ("%d%d", &max1, &max2); // read first two numbers
    if (max2 > max1) { // interchange these (in three steps)
        num = max1 _____;
        max1 = max2 _____;
        max2 = num _____;
    }

    for (i = __ 3 ____; i <= TOTAL; i++) {
        scanf ("%d", &num); // read next number
        // make necessary updates to max1 and max2
        if (num > max1) {
            max2 = max1 _____;
            max1 = num _____;
        } else if (num > max2 && num < max1) _____
            max2 = num _____;
        } // end-for
    printf ("Second largest integer: %d\n", max2);
    return 0;
}
```

8

3. Divisibility of a number by 9 is defined recursively as follows: 0 and 9 are divisible by 9, any other number is divisible by 9 if and only if the sum of its digits is divisible by 9.

You are required to fill up the parts of the code that are left blank so that the overall code tests whether the given number is divisible by 9.

```
#include <stdio.h>
int main () {
    int num, digitSum;
    scanf ("%d", &num); // read num, assume num ≥ 0
    // reduce as per recursive definition, if necessary

    while ( num > 9 ) {
        // find the sum of the digits of num

        digitSum = 0; // initialise

        while ( num > 0 ) { // digits remain

            digitSum += num % 10; // add digit

            num /= 10; // drop digit
        } // end-while
        // prepare for next round of reduction

        num = digitSum;
    } // end-while, reduction complete
    // now test the base cases

    if ( num == 0 || num == 9 )
        printf ("given number is divisible by 9\n");
    else
        printf ("given number is not divisible by 9\n");
    return 0;
}
```