

Name: \_\_\_\_\_

Roll Number: \_\_\_\_\_ Section: \_\_\_\_\_

Department of Computer Science and Engineering  
IIT Kharagpur

Programming and Data Structure (CS11001)

Spring 2010-11 Semester :: Class Test 1

Date: 2<sup>nd</sup> February, 2011

Marks: 40

Time: 1 hour

Answer all the questions

1. Consider the following declaration in C: [8]

```
int a, b, c, d, e;  
float x, y, z;  
char m, n;  
a=20; b=38; d=10; e=5;  
x=2.5; y=12.0;  
m='p';
```

Fill up the following table with expected values:

<code>c = a / (b % a);</code>	<code>c = 1</code>
<code>z = (a/8) + (float) a/8;</code>	<code>z = 4.5</code>
<code>c = (a+b)/x;</code>	<code>c = 23</code>
<code>n = m + b/a*2;</code>	<code>n = 'r'</code>
<code>z = (float) (b / a);</code>	<code>z = 1.0</code>
<code>d = (d += 100, e *= d);</code>	<code>d = 550</code>
<code>c = a++ - (--b + 5);</code>	<code>c = -22</code>
<code>a = 20; b = 38; c = 12; c -= a - b;</code>	<code>c = 30</code>

2. How do you compute  $x^y$  using the mathematical library function `double exp(double x)` and `double log(double x)` (without using `double pow(double x, double y)`)? Assume both `x` and `y` are positive. [3]

`exp(y*log(x))`

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3. What will be printed by the following program?

[3]

```
int f (int a) {
    printf ("%d,", a);
    a++;
    return a;
}

int main() {
    int a = 5, b;
    b = f(a);
    printf ("%d,%d\n", a, b);
    return 0;
}
```

5,5,6

[Comment: Give 1  
mark for each number  
printed]

4. A ball is released from a height of 10 metres. When it bounces on the floor, its direction reverses and its velocity reduces by 10%. [5+5]

- (a) Write a function V(x) that returns the velocity of the ball just before it hits the ground when dropped from a height of x metres.
- (b) Write a program which prints the velocity of the ball after each bounce for the first ten bounces.

(a)

```
double V( float x) { // Works well for float and double
    return sqrt(2*9.8*x); // 2 marks for usage of the sqrt function
} // 2 marks for function definition
```

(b)

```
#include <stdio.h>
#include <math.h> // Deduct 1 mark if math.h is not included

int main() {
    double velocity=0; int i; // Deduct one mark if types are incorrect

    velocity = V(10); // 1 mark for computing the velocity after first bounce
                    // Writing velocity = sqrt(2*9.8*x) is also fine

    for (i=1; i<=10; i++) // 1 mark for the loop – maybe implemented with while
    {
        printf("Velocity after bounce %d = %f\n", i, velocity); // 1 mark for printf
        velocity = 0.9 * velocity; // 2 marks for this statement
                                // Some people may not realize that after bouncing,
                                // the ball returns to ground with the same velocity
                                // Deduct one mark if it is correct otherwise.
    }
}
```

5. Write a C program segment to read an integer, and check if the sum of its digits is divisible by 7. The program will print either of the following two messages (example outputs shown): [10]

The sum of the digits of 2356 is 16, which is not divisible by 7  
The sum of the digits of 2336 is 14, which is divisible by 7

```
#include <stdio.h>
main()
{
    int m, n, sum=0;
    printf ("\nEnter the number: ");
    scanf ("%d", &m);
    n = m;

    do {
        sum = sum + (n%10);
        n = n / 10;
    } while (n!=0);

    if ((sum%7)==0) /* is divisible by 7 */
        printf ("\nThe sum of the digits of %d is %d, which
is divisible by 7", m, sum);
    else
        printf ("\nThe sum of the digits of %d is %d, which
is not divisible by 7", m, sum);
}
```

2 marks

5 marks

3 marks

6. What will be the output of the following program?

[6]

```
#include <stdio.h>
int main()
{
    int i, j, k;

    for (i=1;i<10;i++) {
        printf ("\n %d: ", i);
        for (j=1;j<10;j++) {
            if (i%3 == 0) break;
            if (i > j) continue;
            k=i*10+j;
            printf (" %d", k);
        }
    }
}
```

```
1: 11 12 13 14 15 16 17 18 19
2: 22 23 24 25 26 27 28 29
3:
4: 44 45 46 47 48 49
5: 55 56 57 58 59
6:
7: 77 78 79
8: 88 89
9:
```

Showing 1:.. 2:.. .. on each line :: 1 mark  
No numbers printed on 3,6,9 :: 2 marks  
Remaining numbers printed :: 3 marks

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