0	1	2	3	4	5	6	7	Total

Indian Institute of Technology Mandi

IC150: Quiz 2

15th May 2013, 8:00-8:50 a.m.

Answer all questions. ***No calculators or cellphones***. Maximum marks: 25

0) The minimum attendance requirement for a teacher in his/her own lectures should be: [½]
   a) 0%
   b) 50%
   c) 75%
   d) 100%

1) Fill in the blanks: [4½]

   a) An example of Fibonacci numbers in Nature is _____.

   b) The array `a` is declared by `char a[10][10]` and it starts at memory location 100. The address of element `a[5][3]` is _____.

   c) A pointer `p` that may be used to point to any data type must be declared by _____`*p`.

   d) Given the declarations:
   ```
   struct point { int x, y; } p1;
   struct point *p2 = &p1;
   ```
   Two ways of accessing the value of the `x` component of `p1` are _____ and _____.

   e) The **best-case** time complexity of selection sort is _____ and that of insertion sort is _____.

   f) The C string `"count me in"` requires at least _____ bytes of memory.

   g) Complete the C code: _____`float Length; Length x, y;`

2) Write a C function `char *GenString(char ch, int len)`. This function allocates storage for a string of `len` characters each having value `ch`. It returns the new string. Eg. `GenString('a', 3)` returns the string `"aaa"` and `GenString('z', 0)` returns the empty string `""`. [3]

```
char *GenString(char ch, int len)
{
    _____

    _____

 for (_____)

    _____

    _____

    _____
}
```

3) Answer briefly: [5]

(a) What is meant by the *Golden Ratio*?

(b) Name one algorithm that uses the divide-and-conquer strategy.

(c) A character array is used to store the name of any State of India. What size of array would you choose? Justify your answer.

(d) What is the value of n after the following code is executed? Explain.

```
#define mystery(a, b) a * b
n = mystery(2+2, 3+3);
```

(e) Given the declaration `struct s { int a, b, c;} s1, s2;` which one of the following is **not** valid? Explain.

a) `s1 = s2;`

b) `s1.a = s2.b + s2.c;`

c) `if (s1 > s2) s1.a++;`

d) `if (s1.a < s2.a) s1.a++;`

4) Consider the C code below. [4]
(a) What is printed out by this program?
(b) What is the purpose of this function?
(c) Will the function achieve this purpose for all values of strings `a` and `b`? Justify your answer.

```
#include <stdio.h>
void Doit(char *s, char *t)
{
  while (*t) t++;
  t--;
  while (*s)
   {
     *t = *s;
     t--; s++;
   }
}

void main()
{
  char a[] = “one”;
  char b[] = “two”;
  Doit(a, b);
  puts(a);
  puts(b);
}
```

5) It is desired to sort an array in descending order using (a) selection sort and (b) insertion sort. In the figures below, show the contents of the array after the first and second iterations. In each iteration, circle the elements that you modify. [2]

(a) Selection Sort

Initial	23	20	7	-2	90	10	5	50
Iteration 1								
Iteration 2								

(b) Insertion Sort

Initial	23	20	7	-2	90	10	5	50
Iteration 1								
Iteration 2								

6) A C array is declared by `int m[A][B][C]`. Its starting address in memory is m_{base}. Derive an expression for the address of `m[i][j][k]`. [2]

7) The following structures were developed to represent a book. [4]

```
struct book
{
  struct page frontCover;
  struct page backCover;
  struct binding bindingType;
  struct page initial[10];
  struct page mainPages[1000];
};
```

```
struct page
{
  char pageText[1000];
  int pageNumber;
  int fontType;
};

struct binding
/* 1 Soft, 2 Hard, 3 Cloth */
{
  int type;
}
```

The following are statements about the above representation. **State if each is true or false and explain your answer.**

a. The number of characters allotted for the front is too much for an average front cover.

b. A book can contain over 10,000 main pages.

c. The same page number can be assigned to different pages.

d. Each character in the book can be allotted a different font.