Bengal Engineering and Science University, Shibpur
B.E. (Arch, CST, EE, ETC, IT) 2nd Semester Final Examination 2012-13
Introduction to computing
CS-1201

Time: 2hrs   Full Marks: 35

*Attempt question 1 and any **three** from the rest. 1 mark is reserved for neatness. Credit will be given to precise answers.*

1. Attempt any 5 questions.   [5x2]

   (a) Name two C operators that can only be applied on integer operands.

   (b) Give 8-bit 2s complement representation of −45 and 20.

   (c) Differentiate between local and global variables in C, giving a suitable example.

   (d) Let a and b be variables of int type with values 3 and 2 respectively. What will be the result of the following?

         `i) a++*--b`   `ii) (a > b) && (i = j)`

   (e) Which of the following are infinite loops? Assume that i is an integer variable initialized to 0.

         `i) for(;;);`   `ii) for(;i=0;1);`   `iii) for(i=1;i=5;i++);`

   (f) Write a parameterized macro to find the maximum of two numbers.

   (g) Convert $(51.25)_{10}$ into binary.

2. (a) Write a function that takes an integer as argument, and calculates and returns the sum of the digits of the argument. For instance, if 123 is given as argument, it should calculate and return $1 + 2 + 3 = 6$.

   (b) Write a code segment that creates a dynamic array of int datatype of size n, where n is a user-input.   [5+3]

3. (a) Write the truth tables of NAND and NOR logic gates. Design OR, AND and NOT gates using NAND gates only.

   (b) Subtract 58 from 35 using 8-bit 2's complement representation.   [5+3]

4. (a) The Fibonacci sequence is defined as follows: the first two numbers are 0 and 1 respectively, and any other number in the sequence is the sum of the previous two numbers in the sequence. For instance, the first few numbers of the Fibonacci sequence are 0, 1, 1, 2, 3, 5, 8, ... Write a *recursive* function to calculate and print the nth Fibonacci number, where n is the argument passed to the function.

   (b) While passing parameters to functions in C, which one of the following is more efficient? Justify your answer. (i) passing the value of a variable, (ii) passing the address of a variable.   [5+3]

5. (a) Consider the following code segment:

   ```
   int a[10] = {0,5,9,3,2,1,7,8,4,6};
   int *p = &a[0];
   int *q = &a[5];
   ```

   Assume that the starting address of the array a is α, and an integer occupies 4 bytes in memory. Which of the following operations are valid? For the ones which are valid, also give their results.

         (i) p+q (ii) q - p (iii) p*q (iv) p++ (v) q--

(b) Write a function that takes a string as argument and reverses the string in-place (i.e., without using any other array). Do *not* use any string library functions. [5+3]

6. Define a structure *comp* to store a complex number. Use this structure to write
(i) a function that takes two complex numbers as arguments, and calculates and prints the sum of the two arguments,
(ii) a function which takes a complex number and an integer as arguments, and multiplies the complex number with the integer.
The functions should display the results in the form A + iB or A − iB. Also write a main() function which takes as input two complex numbers and an integer, and uses the above functions suitably. [8]

7. A file *marks.txt* contains marks obtained by students in a subject. Each line contains the roll number (integer) of a student and his marks (float), separated by white space. For example, few lines are

```
1009105 70
1009107 88.5
```

A grading system is as follows

Marks	Grade
≥ 80	A
$60 - -79$	B
$40 - -59$	C
≤ 40	F

Write a program which reads the file *marks.txt*, and computes the grade of each student. The program should also write the roll number and grade of each student into another file *grades.txt*. [8]