Bengal Engineering and Science University, Shibpur
B.E. (AR, CST, EE, ETC, IT) 2nd Semester Examination, 2011-12

Introduction to Computing (CS-1201)

Time: 2 Hours **Full Marks: 35**

Attempt question no. 1 and any FOUR questions from the rest.
All parts of the same question are to be answered together.

1. Attempt any FIVE of the following questions: (5 x 3 = 15)

(a) What are the distinct integers that can be represented using 4-bit 2's complement binary representation? Write the binary and decimal representations for each of these integers.

(b) Draw a logic gate circuit to implement the following function:

$$F = (A + \overline{B} + C).(\overline{A} + B + \overline{C})$$

where $\overline{X}$ denotes the negation of X.

(c) Draw the truth-table of a Half-adder. Implement half-adder with logic circuit. What is the difference between a Half-adder and a Full adder?

(d) Mention some differences between the primary memory and secondary memory in a computer.

(e) What is ASCII code? If the ASCII code of character 'A' is, say, x (x is a positive integer) then the code for 'B' would be $x + 1$; explain why?

(f) Why are NAND and NOR gates known as Universal gates? Show the NAND realisations of all the basic gates (i.e., AND, OR and NOT).

(g) Name all Input and Output devices commonly used in Computers.

2. Write a C function *int secondLargest(int arr [ ], int len)* that takes as arguments an array *arr* of integers of size *len*, and finds and returns the second largest element in the array.
For instance, *secondLargest(1, 5, 9, 8, 3, 5)* should return 8. [5]

3. Write a C function *int contains(char *s1, char *s2)* that accepts two strings *s1* and *s2* as arguments and returns the number of times the second string *s2* occurs within the first string *s1*.

For example, contains("abcdabcdbca", "bc") returns 3, contains("abcdabcdbca", "abd") returns 0. [5]

4. Write a C program that accepts a 10×10 matrix as input (to be stored as a two dimentional array) from the user and checks if the matrix is symmetric. A square matrix is symmetric when $A_{ij} = A_{ji}$ for all i, j and $i \neq j$. [5]

5. a) Write a function *int fact (int n)* which computes the factorial of n. You may use a recursive or an iterative function.
(b) Give two examples of preprocessor directives in a C program, stating the utility of each. [3+2]

6. Define the following structures:
(i) A structure named *point* that stores a point in 2-d coordinate plain (i.e., its x and y coordinates)
(ii) A structure named *circle* that stores a circle (i.e., its centre as a point with x and y co-ordinates and the length of its radius)
Write a C function that takes a circle and a point as arguments (using the above two structures), and returns 1 if the point lies within the circle and 0 otherwise. [5]

7. Consider a text file named "numbers.txt" that contains a list of integers, one integer per line. Write a C program that reads this file, and creates two different files - one file named "even.txt" containing all the even numbers in "numbers.txt", and another file named "odd.txt" containing all the odd numbers in "numbers.txt". The files "even.txt" and "odd.txt" should be written in the same format as "numbers.txt", i.e., one integer in each line. [5]