

BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR

B.E. 1st Semester Examination, 2011

Introduction to Computing (CS 1201)

Full Marks: 35

Time: 2 hours

Answer question 1 and any three from the rest

The entire paper must be answered on a single answer script

All parts of the same question are to be answered together

1. a) Using 1's complement or 2's complement binary arithmetic with 4-bit representation, (i) add the decimal numbers 2 and 4 (ii) subtract the decimal number 4 from the decimal number 2.
- b) Draw a logic gate circuit to implement the following function: $F = X.Y.Z + X.Y'.Z' + X'.Y.Z$ where X' indicates the negation of X .
- c) Consider the following program that takes 10 numbers as input and displays their sum.

```
#include<stdio.h>
main( )
{
    int sum, j;
    for( j = 0; j <= 10; j++ )
    {
        scanf ( "%d", n );
        sum += n;
    }
    printf ( "Sum is %d\n", sum );
}
```

There are at least 4 errors in this program. Identify them, and suggest corrections.

- d) What is the difference between while loop and do...while loop? [3 + 3 + 3 + 2]

2. a) Write a C function `int range(int arr[], int n)` that takes as argument an array of integers and the number of elements in the array, and returns the difference between the maximum and minimum integers in the array. For example, `range({2, 4, 8, 1, 3}, 5)` returns 7.

- b) Convert 27.625 from decimal to binary. [4 + 4]

3. a) Give the truth-table for a half-adder (which adds two bits) and a logic gate circuit to implement a half-adder.

- b) What are the advantages of using functions in a C program? Write a function that takes two integers x and y as arguments and returns x^y . Do not use any C library functions inside this function. Also, write a `main()` function that takes two integers a and b as input and uses the above function suitably to compute a^b .

[3 + 5]

4. a) Define a structure 'line' to represent a line segment in 2-d coordinate space. The line segment will be represented as the (x and y coordinates of the) two end-points of the segment.

b) Write a program that takes a line segment as input (i.e. takes as input the two end-points) and then computes and prints (i) slope of the line segment, (ii) midpoint of the line segment. [2 + 3 + 3]

5. a) Write a program that takes two positive integers as input and computes and prints the GCD (greatest common divisor) of the two integers.

b) Write a function that takes a string as argument and reverses the string in-place (i.e. the reversed string must be stored in the same array as the argument). Do not use any library function from `string.h` in the function. [4 + 4]

6. a) Write a program that takes a positive integer as input and computes and prints the sum of all digits of the number. For example, if the input is 14082, the program must print 15.

b) Write a program that takes as input a 5×5 matrix (using a two-dimensional array) and computes its transpose. The program must take the elements of the matrix as input, store the transpose in another array, and then print out the elements of the transpose matrix. [4 + 4]

7. A file "phone.txt" contains the names and phone number of certain people. Each line contains the name and phone number of a single person, in the following format.

Ravi 033 26610234

Uday 022 25419023

Shyam 033 24519807

Rahul 072 278901

...

Note that the phone number consists of two parts: (i) city-code, and (ii) number, separated by a blank space.

Write a program that takes as input a city-code from the user, reads the file "phone.txt", and then prints out the names and phone numbers of those people whose phone numbers contain the given city-code. For example, if the user inputs the city code "033", the program must print out:

Ravi 033 26610234

Shyam 033 24519807