37½

Name - SHOBHAM

Entry no- [illegible]

A-5

Group no - 28

CSL 100: Introduction to Computer Science

7 February 2014, 09:30-10:30 AM

Maximum Marks: 50

1. **[10 Marks]** An integer array A[n] stores the binary representation of an n-bit (positive or negative) number. A[i] = 0 if the bit in the i-th position is 0, and 1 otherwise. For example, if n=5, then the number k=6 (with binary representation "00110") would be stored as follows: A[4] = 0, A[3] = 0, A[2] = 1, A[1] = 1, A[0] = 0. Write a C++ program that reads an integer k from the user and stores its binary representation in array A.

```
#include<iostream>
using namespace std;          // using representation of sign magnitud
int main(){                   // to represent negative numbers.
    int i, k, r, q j
    const int n=10; // Jaking n=10 to increase range which can
    cout << "Enter an integar"<<endl;
    cin >> k;
    int A[n]; // Array containing binary digits
    for(i=0; i<n; i++)
        A[i]=0; // Initialising all elements with zero
    if ( k<0)
      { A[0]=1; k=-1*k;} // If number is negative first element be
                          // and binary code of absolute value
    q=k; i= n-1;
    while (q!=0)
  { r= q%2;
    a[i] = r;
    q=q/2; i--; }       return 0; }
```

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Revers

2. **[10 Marks]** Given an n-bit binary number: $b_{n-1}b_{n-2}...b_1b_0$, where each b_i can be 1 or 0, with b_{n-1} being the most significant digit, give a method for converting this representation directly into an octal number (with base 8) without converting to any intermediate (decimal or other) representation. Prove that this method is correct. Do not write any program.

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b b b b b is represented as

3. **[10 Marks]** The following code attempts to reverse the decimal digits of a positive integer k. Fill in the blanks so that the logic is correct.

```
int i,j,k;
cin >> k; // Read an input number
j = 0; // Result initialised to zero
while (....K != 0.....) { // Insert the appropriate condition
 i = k % 10; // "%" gives "k mod 10"...the remainder when k is divided by 10
                                    // Complete the program

   j = 10*j + i ;

 k = k / 10; // Integer division "/" gives the quotient. Remainder is ignored
}
cout << j; // Print the result
```

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4. **[20 Marks]** An array *Marks[1000]* contains the marks (between 0 and 100) obtained by 1000 students in an examination, stored in increasing order (*Marks[i]* ≤ *Marks[i+1]* for all *i)*. We wish to assign grades *A*, *B*, and *C* to the students, in an array *Grades[1000]*, in the following way. We first determine the two positions in the *Marks* array with the largest GAPs between consecutive marks, and use these gaps to obtain the cut-offs separating the grades. Write a C++ program to perform the grade assignment.
Example 1: If the marks are [1,2,5,6,10,11] then the grades are [C,C,B,B,A,A]
Example 2: If the marks are [1,2,5,8,11,12,12] then the gap of 3 appears at 3 places (2-5, 5-8, and 8-11), and the grades could be any of [C,C,B,B,A,A,A], [C,C,B,A,A,A,A] or [C,C,C,B,A,A,A]. Your program should output any one of these three arrays.

```
int Marks [1000];
char Grades [1000];
// Assume Marks array is already filled in increasing order, with numbers between 0-100
// Complete the program
```

~~int Diff [100] Diff [1000~~

int Diff [999]; // To store difference between 2 co