DAY 45

Elements of Programming Interview :

1. Compute x*y without multiply or add

Write a function that multiplies two unsigned positive integers.The only operators that you are allowed to use are assignment and bitwise operators,i.e ^,>>,<<,~,|,& (you cannot use increment or decrement).You may use loops,conditionals and functions that you write yourself.

CODE :

C++

```
#include<iostream>
using namespace std;
unsigned multiply_fun(unsigned x,unsigned y);
unsigned add_fun(unsigned a,unsigned b);

int main(){
	unsigned num1;
	unsigned num2;
	cin>>num1;
	cin>>num2;
	cout<<"Result of multiplication : "<<multiply_fun(num1,num2);
}

unsigned multiply_fun(unsigned x,unsigned y){
	unsigned result=0;
	while(x){
		if(x&1){
			result=add_fun(result,y);
		}
		x>>=1;
		y<<=1;
	}
	return result;
}

unsigned add_fun(unsigned a,unsigned b){
	unsigned sum=0,c_in=0,k=1,temp_a=a,temp_b=b;
	while(temp_a||temp_b){
		unsigned ak=a&k,bk=b&k;
		unsigned c_out=(ak&bk)|(ak&c_in)|(bk&c_in);
		sum|=(ak^bk^c_in);
		c_in=c_out<<1;
		k<<=1;
		temp_a>>=1;
```

```
        temp_b>>=1;
    }
    return sum|c_in;
}
```

2. Compute x/y

Given two positive integers,compute their quotient,using only addition,subtraction and shifting operators.

CODE:

PYTHON

```
num1=int(input())
num2=int(input())

def quotient_compute(x,y):
    q=0
    while x>=y:
        p=1
        while ((y<<p)>=(y<<(p-1))) and ((y<<p)<=x):
            p+=1
        q+=1<<(p-1)
        x-=y<<(p-1)
    return q
print("Quotient is given by : ",quotient_compute(num1,num2))
```

3. The Dutch National Flag Problem

Write a function that takes an array A of length n and an index i into A, and rearranges the elements such that all elements less than A[i] appear first,followed by elements equal to A[i],followed by elements greater than A[i].Your algorithm should have O(1) space complexity and O(n) time complexity.

CODE :

PYTHON

```
n=int(input())
A=list(map(int,input().strip().split()))[:n]
j=int(input())
pivot=A[j]
s=0
l=len(A)-1
curr=0
while curr<=l:
    if A[curr]<pivot:
        A[s],A[curr]=A[curr],A[s]
        s+=1
```

```
            curr+=1
        elif A[curr]==pivot:
            curr+=1
        else:
            A[curr],A[l]=A[l],A[curr]
            l-=1
print(A)
```