# Design and Analysis of Algorithms Assignment - 5

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## Fast Modular Exponentiation

### Approach 1: *Using Divide n Conquer*

**CODE :**

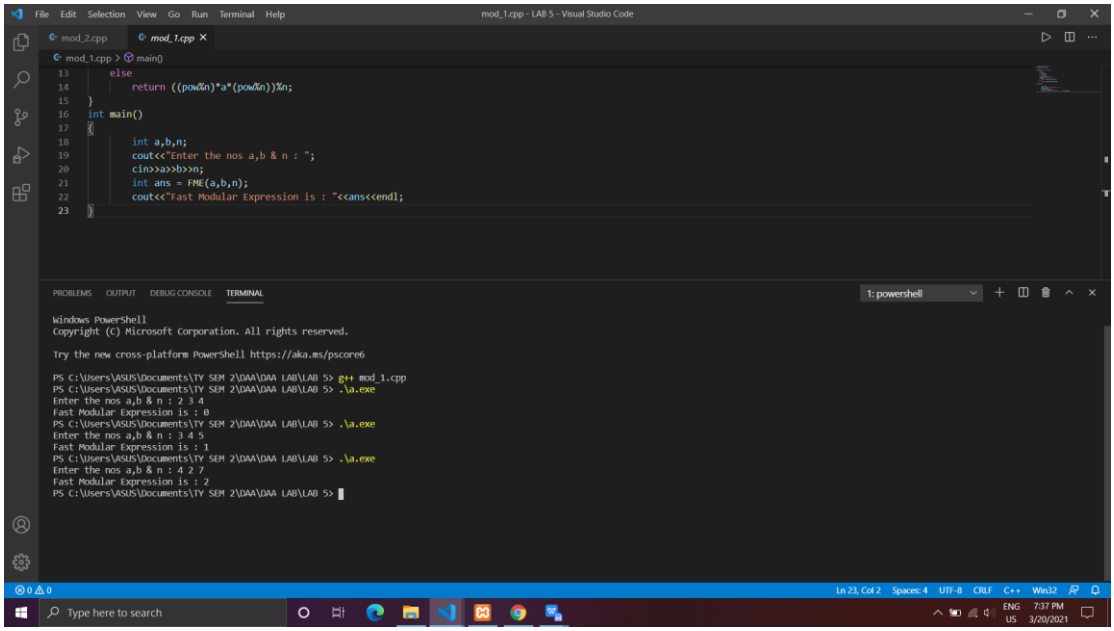
```
#include<bits/stdc++.h>
using namespace std;


int FME(int a,int b,int n)
{
    if(b==0)
        return 1;
    else if(b==1)
        return a;
    int pow = FME(a,b/2,n);
    if(b%2==0)
        return ((pow%n)*(pow%n))%n;
    else
        return ((pow%n)*a*(pow%n))%n;
}
int main()
{
        int a,b,n;
        cout<<"Enter the nos a,b & n : ";
        cin>>a>>b>>n;
```

```
        int ans = FME(a,b,n);

        cout<<"Fast Modular Expression is : "<<ans<<endl;
}
```

## O/P :




## Approach 2 : *Using Bit Manipulation*

## CODE :

```
#include <bits/stdc++.h>

using namespace std;



long long FME(long long a, long long b, long long n)

{

    long long res = 1;

    while (b > 0)
```

```
    {
        if (b & 1)
        {
            res = (res * a) % n;
        }
        a = (a * a) % n;
        b = b >> 1;
    }
    return res;
}
int main()
{
    long long a, b, n;
    cout << "Enter the nos a,b & n : ";
    cin >> a >> b >> n;
    long long ans = FME(a, b, n);
    cout << "Fast Modular Expression is : " << ans << endl;
}
```

## O/P :