**Rajshahi University of Engineering & Technology**

CSE 2102: Sessional Based on CSE 2101

Lab Report 07

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**Experiment No. 3**

**Name of the Experiment: Algorithms, Number Theory and Cryptography.**

**1. EXPERIMENT [20]**

Given two positive integers, find their greatest common divisor using the Euclidean algorithm.

**SOLUTION:**

#include <iostream>

using namespace std;

int main() {

int a, b, r;

cout << "Enter the two numbers: ";

cin >> a >> b;

while(b) {

r = a % b;

a = b;

b = r;

}

cout << "GCD = " << a;

}

OUTPUT:

Enter the two numbers: 36 12

GCD = 12

Enter the two numbers: 55 11

GCD = 11

**Discussion:** GCD can also be determined by other algorithms rather than the Euclidean algorithm, but this algorithm is much efficient.

**2. EXPERIMENT [21]**

Given two positive integers, find their least common multiple.

**SOLUTION:**

#include <iostream>

using namespace std;

int main() {

int a, b, temp, i;

cin >> a >> b;

if(b < a) {

temp = a;

a = b;

b = temp;

}

for(i = b; i < b \* b; i++) {

if(!(i % a) && !(i % b)) {

cout << "LCM = " << i << endl;

break;

}

}

}

OUTPUT:

55 11

LCM = 55

123 6

LCM = 246

**3. EXPERIMENT [22]**

Given a positive integer, find the prime factorization of this integer.

**SOLUTION:**

#include <iostream>

using namespace std;

bool isPrime(long long p) {

int flag = 1;

for(int i = 2; i \* i <= p; i++) {

if(p % i == 0) {

flag = 0;

break;

}

}

if(1 == flag) {

return true;

} else return false;

}

int main() {

long long a, j = 2;

cin >> a;

int i, k, counter = 0;

int prime[100];

for(i = 2; i < 550;) {

if(isPrime(i) && a % i == 0) {

counter++;

a /= i;

continue;

}

if(counter) {

cout << "i = " << i << ", counter = " << counter << endl;

}

counter = 0;

i++;

}

}

OUTPUT:

123

i = 3, counter = 1

i = 41, counter = 1

567

i = 3, counter = 4

i = 7, counter = 1.

**Discussion:** Prime factors are determined as 567 = 3 X 3 X 3 X 3 X 7 as it is shown by counter in the second output.