Experiment - 2

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Subject Name: Design and Analysis of Algorithms
Subject Code: 23CSH-301

1. **Aim:** To impement power function in O(nlogn) time complexity.

2. **Objective:** The main objective is to implement an efficient power function using Divide and Conquer approach that runs in logarithmic time.

3. **Input/ Apparatus Used:**
   - Programming in language C++.
   - Technique: Exponentiation by squaring(divide exponent by 2 to reduce complexity).

4. **Algorithm/Pseudocode:**
   power(x, y):
      if y == 0:
         return 1

      temp = power(x, y/2)

      if y is even:
         return temp * temp
     else
      if y > 0:
         return x * temp * temp
     else
         return (temp * temp) / x   // handles negative power

5. Code and output:

```cpp
#include <iostream>
using namespace std;

// Artificially O(n log n) power function
double power(double x, int y) {
    if (y == 0) return 1;

    double temp = power(x, y / 2);
    if (y % 2 == 0)   // even exponent
        return temp * temp;
    else {
        if (y > 0)
            return x * temp * temp;
        else
            return (temp * temp) / x;
    }
}

int main() {
    double x;
    int y;
    cout << "Enter base: ";
    cin >> x;
    cout << "Enter exponent: ";
    cin >> y;

    cout << x << "^" << y << " = " << power(x, y) << endl;
    return 0;
}
```

```
C:\Users\hp\Desktop\stack.ex   X      +    v

Enter base: 2
Enter exponent: -3
2^-3 = 0.125


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Process exited after 5.791 seconds with return value 0
Press any key to continue . . .
```