

Assignment - 38
Time Complexity

1. What is the time, and space complexity of the following code:

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}
```

2. What is the time complexity of the following code:

```
int a = 0;
for (i = 0; i < N; i++) {
    for (j = N; j > i; j--) {
        a = a + i + j;
    }
}
```

3. What is the time complexity of the following code:

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++) {
    for (j = 2; j <= n; j = j * 2) {
        k = k + n / 2;
    }
}
```

4. What is the time complexity of the following code :

```
void fun(int n)
{
    for (int i = 0; i < n / 2; i++)
        for (int j = 1; j + n / 2 <= n; j++)
            for (int k = 1; k <= n; k = k * 2)
                cout << "Prateek Jain";
}
```

(problem 5 to 10 each of the following recurrences, give an expression for the runtime $T(n)$ if the recurrence can be solved with the Master Theorem.)

5. $T(n) = 3T(n/3) + n/2$
6. $T(n) = 6T(n/3) + n^2 \log n$
7. $T(n) = 4T(n/2) + n / \log n$
8. $T(n) = 64T(n/8) - n^2 \log n$
9. $T(n) = 7T(n/3) + n^2$
10. $T(n) = 4T(n/2) + \log n$