**Report**

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**4. Graph showing computational time and n:**

The graph that we plotted previously closely corresponds to the graph of the function:

f (n) = O (n2)

Therefore, we can say that the function f (n) = O (n2) is the approximate time complexity of or program.

**5. Theoretical Complexity:**

Line (1-17), (27-30), (55-68) will not have an effect on the final time complexity as they all linear O (1).

There are two nested loops.

1st nested loop:

From line 18-26, there is an inner loop in this nested loop.

Inner loop iterates (n+1) times.

Outer loop iterates (n+1) times.

2nd nested loop:

From line 30-54, there are two inner loops in this nested loop. 2nd inner loop will not have an effect on the final time complexity as they all linear O (1).

First inner loop iterates (n+1) times.

Outer loop iterates (n+1) times.

The average case complexity, f (n)

= (n+1) (n+1) + (n+1) (n+1)

= n2+2n+1+ n2+2n+1

=2n2+4n+2

**Big-O Notation:**

2n2+4n+2 <= 2n2+4n2+2n2

= 8n2

So, 2n2+4n+2 = O (n2)

Here, C = 8 and k = 1

Therefore, the time complexity found in step 4 and the time complexity of our program are same.

**Vertex Time**

**1000 32718000000**

**2000 139534000000**

**3000 270084000000**

**4000 467450000000**

**5000 805160000000**