2. (25%)

(a)

$j \leftarrow 1$ ▷ 1 time
**while** $j < n$ **do** ▷ n-1 times
  $S_1$ ▷ n-2 times
  $k \leftarrow n$ ▷ n-2 times
  **while** $k > j$ **do** ▷ n-j times
    $S_2$ ▷ n-j-1 times
    $k--$ ▷ n-j-1 times
  $j++$ ▷ n-2 times

For the inner statements, this can be represented by:

$$\begin{aligned}
T(n) &= C_0 + \sum_{i=1}^{n-1}(C_1 + S_1 + \sum_{j=i}^{n-1}(S_2 + C_2)) \\
&= C_0 + \sum_{i=1}^{n-1}(C_1 + S_1 + (n-1-i)(S_2 + C_2)) \\
&= C_0 + (n-2)(C_1 + S_1) + (S_2 + C_2)\sum_{i=1}^{n-1}(n-1-i) \\
&= C_0 + (n-2)(C_1 + S_1) + (S_2 + C_2)\Big(n(n-2) - (n-2) - \frac{n(n-1)}{2}\Big) \\
&= C_0 + (n-2)(C_1 + S_1) + (S_2 + C_2)\Big(\frac{n^2}{2} - \frac{5n}{2} + 2\Big) \\
&= C_0 + (n-2)C_1' + C_2'\Big(\frac{n^2}{2} - \frac{5n}{2} + 2\Big)
\end{aligned}$$