Soal 1

Kompleksitas Waktu Analisis Algoritma

Perhatikan algoritma pencarian elemen minimum dalam sebuah array berikut (dalam pseudocode):

```
procedure FindMin(A : array of n elements)
  min ← A[0]
  for i ← 1 to n - 1 do
    if A[i] < min then
      min ← A[i]
    end if
  end for
  return min
end procedure
```

Berdasarkan algoritma di atas, implementasikan dan analisis kompleksitasnya

Ingat!

Tmin(n) = c1 + c2(n-1) + c3(n-1)
≈ an + b
→ O(n)

Tmax(n) = c1 + c2(n-1) + c3(n-1) + c4(n-1)
≈ 2n - 1
→ O(n)

Best Case

Baris	Pseudocode	COST	FREKUENSI	TOTAL COST
1	procedure FindMin	C1	1	C1
2	min ← A[0]	c2	1	c2
3	for i ← 1 to n - 1 do	C3	n	c3(n)
4	if A[i] < min then	C4	n-1	c4(n-1)
5	min ← A[i]	C5	0	0
6	end if	c6	n−1	c6(n−1)
7	end for	c7	n	c7(n)
8	return min	c8	1	c8
9	end procedure	c9	1	c9

T(n) =
C1 + C2 + C3n + C4(n−1) + 0 + C6(n−1) + C7n + C8 + C9

C4(n−1) → C4n − C4
C6(n−1) → C6n − C6

T(n) = C1 + C2 + C3n + C4n − C4 + 0 + C6n − C6 + C7n + C8 + C9

T(n) = (C3 + C4 + C6 + C7)n + (C1 + C2 + C8 + C9 − C4 − C6)

Jika semua Ci = 1:

T(n) = (1+1+1+1)n + (1+1+1+1−1−1)

T(n) = 4n + 2

Karena berbentuk fungsi linear, maka:

$$T(n)=O(n)$$

Worst Case

Baris	Pseudocode	COST	FREKUENSI	TOTAL COST
1	procedure FindMin	C1	1	C1
2	min ← A[0]	c2	1	c2
3	for i ← 1 to n - 1 do	C3	n	c3(n)
4	if A[i] < min then	C4	n-1	c4(n-1)
5	min ← A[i]	C5	n-1	c5(n-1)
6	end if	c6	n−1	c6(n−1)
7	end for	c7	n	c7(n)
8	return min	c8	1	c8
9	end procedure	c9	1	c9

T(n) =
C1 + C2 + C3n + C4(n−1) + C5(n−1) + C6(n−1) + C7n + C8 + C9

C4(n−1) → C4n − C4

C5(n−1) → C5n − C5
C6(n−1) → C6n − C6

Maka:

T(n) = (C3 + C4 + C5 + C6 + C7)n + (C1 + C2 + C8 + C9 − C4 − C5 − C6)

Jika semua Ci = 1:

T(n) = (1+1+1+1+1)n + (1+1+1+1−1−1−1)

T(n) = 5n + 1

Karena berbentuk fungsi linear, maka:

$$T(n)=O(n)$$

OUTPUT