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Algorithm - Concept

→ Every Algo. may take zero / more Inputs

→ Every Algo Must Produce atleast one output

→ Every Algo should Terminate in finite Time.

Algo. Lifecycle

1. Problem definition
2. Requirements
3. Logic / Design
4. Pseudo Algo.
5. Validation
6. Analysis
7. Implementation
8. Testing & Debugging

Topic ⇒ Analysis of Algorithms

→ Need for Analysis (why)

(i) To determine Resource Consumption (what)
Eg: Time + space + Registers. + Cost.

(ii) Performance comparision : To find efficient Sol. (Time)

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Methodology of Analysis (How)

(Time Complexity)

1. [x ← y + z]

(i) Software = - language
- O.S.

(ii) Hardware = - CPU
- Memory
- I O

Platform Environment

↓

Apostorion Analysis

+ Advantage :

① It gives exact values in real units

+ Drawbacks :

1. It is difficult (mannual)
2. Cannot consider for all cases of I/P is
3. Non-Uniformity ⇒ Performance comparision become difficult.

Apriori Analysis

(Platform Independent)

⇒ Analytic Framework :-

(i) Take into account all possible I/P.
(ii) Allows us to calculate the relative efficiency of two Algo. in a way that is independent of Platform.

(iii) Can be carried out by studing the high level description of Algo. without actual Implementation.

(iv) It is easy to carry out.

+ Drawback. ⇒
→ will not give real / Actual values in units.
→ Estimats

Components of Analytic framework

① A lang. for describing Algo steps.
② A Computation model that the Algo. executes within it.
③ A metric for measuring Algo - run Time.
④ An approch / Notation to characterize running Time.

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Algorithm Test

{

1. $x \leftarrow y + z$

2. for $i = 1$ to n
   < $a = b + c$ >

3. for $i = 1$ to n
   for $j = 1$ to n
   < $K = K * m$ >

}

=> Time Complexity of 1. => 2 units.

=> TC of 2. =>

$\underset{\text{Initialization}}{1} + \underset{\text{Condition check}}{(n+1)} + \underset{\text{Increments}}{n} + \underset{\text{Addition operation (+)}}{n} + \underset{\text{Assignment (=)}}{n} \Rightarrow [4n + 2]$

=> TC of 3 =>

loop-1 $[\underset{\text{Initialise}}{i=1} + \underset{\text{condition check}}{(n+1)} + \underset{\text{Increment}}{n}]$ + loop-2 $[\underset{\text{initialise}}{j=1} + \underset{\text{Comparision}}{n(n+1)} + \underset{++}{n \cdot n} + \underset{\text{multiply}}{n \cdot n}]$

(=) assignment

=> $4n^2 + 4n + 2$

$\Rightarrow \quad 2 + (4n+2) + (4n^2+4n+2)$

Total $\Rightarrow$ $\boxed{4n^2 + 8n + 6}$ units.