

Unit 8: Introduction To Complexity Theory

* Define Class P and Class NP.

=> Class P:

The P Class stands for Polynomial Time.

P Class consists those problem which require to solve the Polynomial Time.

P Class consists those problem which require $O(n^k)$ to solve time.

where $k = \text{Any Constant}$.

Ex. All the Searching and Sorting Algorithm.

-> Class NP:

The NP class stands for Non-

Deterministic Polynomial Time

NP class consists those problem which is verifiable by some one.

NP class consists those problem which require to solve the different time.

NP Class Problem time can be change every time.

Decision Making Problem is include in NP class.

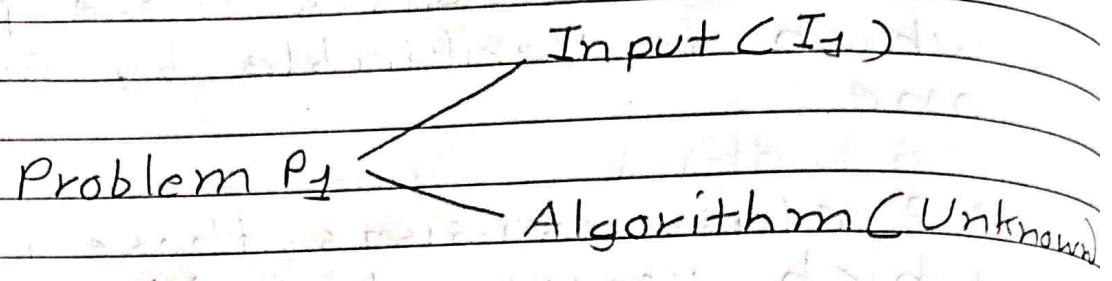
In NP Class, IF there is same n input then every time this Problem gives different output.

* Define Polynomial Reduction:

\Rightarrow IF There is Two Problem P_1 and P_2 and Both Problem has its input.

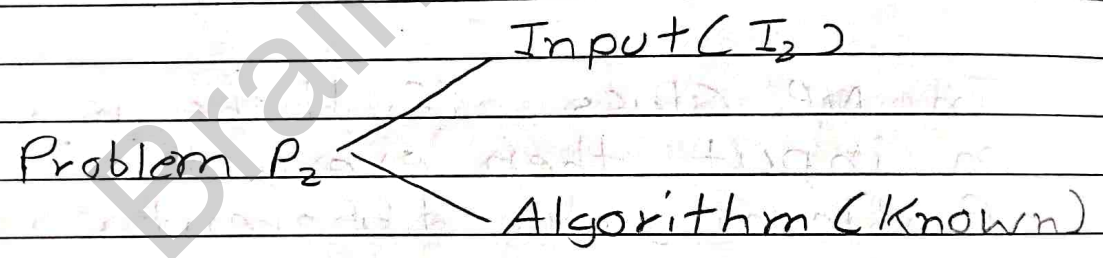
Here, Problem P_1 has I_1 input and For solve the Problem algorithm is required.

But Problem P_1 does not have any type of algorithm.



Here, Problem P_2 has Input I_2 and for solve the Problem algorithm is required.

So, Problem P_2 does have algorithm for solve the problem.



IF Problem P_1 is solve using the Problem P_2 input and algorithm so, It is called Polynomial Reduction.

So, Problem P_1 is Reduce by the Problem P_2 .

* Define NP Hard Problem and NP Complete Problem.

=> NP Hard Problem:

IF Every NP Problem is reduce by any P Problem So, this Problem is called NP Hard Problem.

Ex.

Problem P_1 is NP Problem and Problem P_2 has P Problem with its algorithm.

So, Problem P_1 is Reduce by the P Problem.

So, this Problem P_1 is called NP Hard Problem.

=> NP Complete Problem:

IF Problem n is NP Problem and Every n' problem can ~~by~~ reduce using the Problem n . So this Problem is called NP Complete Problem.

Ex.

Problem P_1 is a NP Problem.
Problem P_2 is also NP
Problem.

If Problem P_2 is Polynomial
Reduce to Problem P_1 .

So This Problem P_1 is
called NP Complete Problem.