

Class - P : P is a class of Languages that are decidable in polynomial time on a deterministic single tape Turing machine.

Class - NP : NP is a class of Languages that are decidable in polynomial time on a nondeterministic Turing machine.

Clique: A clique in an undirected graph is a sub graph, wherein every two nodes are connected by an edge.

- If $P = NP$ then we have to show that “a polynomial time algorithm exists that takes an undirected graph as input and finds the largest clique in the graph.
- A k – clique is a clique that have k -nodes.
- We know that “clique is in NP ”.
- So if $P = NP$ then clique is in P .

Therefore, if $P = NP$ then clique is recognizable in polynomial time.

The following algorithm will find the largest clique in the graph:

1. Let n be the no. of nodes in the given graph G .

i be the variable which runs from 1 to n .

2. Using the polynomial time algorithm for clique, check whether there exist a clique of size i .

3. Output the Largest i for which a clique exists.

To find the maximum clique, we start with i , the maximum clique size.

Remove one node and see if there is still a clique of size i .

If not, restore that node and remove another node.

If so, respect the process until we are left with a graph of i nodes, which must be a clique.

- This algorithm will take almost n trials to find which node to remove and at most n nodes to be removed.

Then the total running time is polynomial.