Problem

A ***triangle*** in an undirected graph is a 3-clique. Show that *TRIANGLE* ? P, where *TRIANGLE* = { $\langle G \rangle$ I G contains a triangle}.

Step-by-step solution

Step 1 of 1

<u>Class *P* :</u> *P* is a class of languages that are decidable in polynomial time on a deterministic single – tape Turing – machine.

Specified language,

• A triangle is an undirected graph is a 3 – clique.

• TRIANGLE $=\{\langle G\rangle \mid G \text{ contains a triangle}\}$.

• Now we have to show that TRIANGLE $\in p$

• Let *A* be the Turing machine that decides TRIANGLE is polynomial time

• *A* can be described as follows:

A="on input $G\langle V, E\rangle$:

V denotes set of vertices of the graph *G*.

E denotes set of edges of the graph *G*.

1. For $u, v, w \in V$ and $u < v < w$, we enumerate all triples $\langle u, v, w\rangle$.

2. Check whether all three edges $(u,v),(v,w)$ and (w,u) exist in *E* or not. If exist then accept.

3. Otherwise reject."

• Enumeration of all triple require $o\left(|v|^3\right)$time

• Checking whether all three edges belong to *E* take $O(|E|)$time.

• Overall time is $O\left(|V|^3 |E|\right)$ which is polynomial in the length of the inplet

• Therefore TRIANGLE $\in P$

Comment