Problem

Suppose that A and B are two oracles. One of them is an oracle for *TQBF*, but you don't know which. Give an algorithm that has access to both A and B, and that is guaranteed to solve *TQBF* in polynomial time.

Step-by-step solution

Step 1 of 3

An Oracle Turing machine is a type of Turing machine having many different tapes and these tapes are called oracle tapes. The different states may be represented by q_{states}.

A TQBF is True Qualified Boolean formula. To Show TQBF in polynomial problem which has access to turing machines A and B can be solved by using Baker Gill Solovay Theorem. The problem can be broken up in two parts of algorithm:

Comment

Step 2 of 3

For Oracle A:

1. Consider TQBF has access to A then A=TQBF.

2. In the given problem it can be proved by showing $P^A = NP^B$.

3. As $TQBF$ is $PSPACE$ problem,

4. Hence $PSPACE \subseteq P^{TQBF}$ *and* $PSPACE^{TQBF} \subseteq PSPACE$

5. Therefore, combining both result $P^A = NP^B$.

Comments (1)

Step 3 of 3

For Oracle B:

1. For oracle B it is required to show that $P^B \neq NP^B$.

2. For this define a language L_B as: $L_B = \{0^n \mid w \in \{0,1\}\}$ *Here,* $B(w) = 1$

3. For any oracle B the defined language L_B is NP^B.

4. Now the machine's output will be 1 if $x = 0^n$ with $|w| = |x|$.

5. Here $TQBF \in NL$ this shows that $PSPACE \in NL$

6. By using hierarchy theorems and Baker Gill which states that $NL \subsetneq PSPACE$.

7. It shows that $P^B \neq NP^B$.

Using both two parts of algorithm result it is sure that $TQBF$ is in polynomial time for both oracle A and B.

Comments (1)