Problem

Let EQ_{BP} = { $\langle B_1, B_2 \rangle$ | B_1 and B_2 are equivalent branching programs}. Show that EQ_{BP} is coNP-complete.

Step-by-step solution

Step 1 of 2

Consider $EQ_{BP} = \{\{B_1, B_2\} \mid B_1 \text{ and } B_2 \text{ both are equivalent branching program}\}$

Branching programs B_1 and B_2 can be described by acyclic graph rejects or may accept input strings $s_1, s_2, \ldots, s_n$. For turing machines these problems are un-decidable but these problems are $coNP$ complete for circuits.

Comment

Step 2 of 2

Consider the problem EQ_{BP} that is B_1 and B_2 is restricted to read-once programs. By using the equivalence with $coRP$ for testing the equivalence, and by reduction from $co\text{-}3SAT$ it will be $coNP$.

Polynomial can be determined by following way:

• Assign the vertex in programs EQ_{BP} for branching, from root to final states.

• Label all incoming edges, now vertex polynomials will be sum of polynomials of edge which are incoming.

• Polynomial which is associated with final state 1 will be branching program polynomial.

As the branching program is read-once, and have power not more than one. Hence polynomial cannot be more than degree of n. Hence, EQ_{BP} must be $coNP$.

Comment