Question 6:

Let A = Track work

Let B = Delay

P(A) = 20%

P(B|A) = 70%

P(B|~A) = 5%

Calculate P(A|B)

Using Bayes’ we have P(A|B) = (P(B|A)\*P(A))/P(B)

We know P(B|A) and P(A) so we need P(B).

Since A and ~A are opposite and thus disjunct events, we can calculate P(~A)=1-P(A)=80%

Thus P(B) = P(B|A) \* P(A) + P(B|~A)\*P(~A) = 18%

Then P(A|B)=~77,8%

Base case:

Base case holds.

IH. Assume n-1 holds to prove n.

We can’t prove it.

Q7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | B | C | A -> B v C | -> (~B v ~C) | ~ ( B v C ) |
| T | T | T | T | F | F |
| T | T | F | T | T | F |
| T | F | T | T | T | F |
| T | F | F | F | T | T |
| F | T | T | T | F | F |
| F | T | F | T | T | F |
| F | F | T | T | T | F |
| F | F | F | T | T | T |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | B | C | A -> B v C | B -> ~A | C -> ~A |
| T | T | T | T | F | F |
| T | T | F | T | F | T |
| T | F | T | T | T | F |
| T | F | F | F | T | T |
| F | T | T | T | T | T |
| F | T | F | T | T | T |
| F | F | T | T | T | T |
| F | F | F | T | T | T |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | C | A -> B v C | B v C -> ~A |
| T | T | T | T | F |
| T | T | F | T | F |
| T | F | T | T | F |
| T | F | F | F | T |
| F | T | T | T | T |
| F | T | F | T | T |
| F | F | T | T | T |
| F | F | F | T | T |

# Q1

Incomplete prooftree

Diagram

Description automatically generated with medium confidence

# Q2

Prove by contradiction the following statement:

Let .

Assume , that is, assume there is no such that .

From the fact that we have for some .

We also have that and and thus .

From this we can derive and since , then .

Thus we have: which is a contradiction to our assumption and thus the statement does not hold. Instead we can conclude that .

QED.

# Q3

Let . Prove by induction that .

Inductive hypothesis:

Base case:

Thus the base case holds.

Inductive case:

Assume holds to prove holds.

From the definition of summation we know that

We multiply the two leftmost parentheses and the inner parenthesis in the furthest right side of the equality sign.

We reduce multiply the parentheses.

We reduce.

We factorize k.

Note that .

QED.

# Q4

Consider the following finite state automaton:

A picture containing shape

Description automatically generated

Present a grammar that recognizes exactly the same language.

Let with and the set of productions:

This way, S can produce any number of 0s or go to by writing 1 and then having the non-terminal A. A can either go back to S with a 0 or it can go to 1C or 0B. When it is in B or C it can terminate (by going to the empty string lambda), or it can repeat B->0B (an infinite number of 0s) or repeat C->1C (an infinite number of 1s).