AI 135 proofs

Program

branch 1 → {$}

branch 2 → first(statemt) = first(asignmt) ∪ first(ifstmt) ∪ first(until) ∪ first(read) ∪ first(write)

= first(ident) ∪ {I} ∪ {U} ∪ {R} ∪ {W}

= first(letter) ∪ {I, U, R, W}

= {_, X, Y, Z, I, U, R, W}

→ {_, X, Y, Z, I, U, R, W} ∩ {$} = ∅

statemt

branch 1 → first(asignmt) = first(ident) = first(letter) = {_, X, Y, Z}

branch 2 → first(ifstmt) = {I}

branch 3 → first(until) = {U}

branch 4 → first(read) = {R}

branch 5 → first(write) = {W}

→ {_, X, Y, Z} ∩ {I} ∩ {U} ∩ {R} ∩ {W} = ∅

Asignmt

there are no decision points in this one

Ifstmt

branch 1 → first(statemt) = first(asignmt) ∪ first(ifstmt) ∪ first(until) ∪ first(read) ∪ first(write)

branch 2 → {%}

branch 3 → {&}

→ {_, X, Y, Z, I, U, R, W} ∩ {%, &} = ∅

Until

branch 1 → first(statemt) = first(asignmt) ∪ first(ifstmt) ∪ first(until) ∪ first(read) ∪ first(write)

branch 2 → {\}

→ {_, X, Y, Z, I, U, R, W} ∩ {\} = ∅

Read

branch 1 → {;}

branch 2 → {,}

→ {;} ∩ {,} = ∅

Write

branch 1 → {;}

branch 2 → {,}

→ {;} ∩ {,} = ∅

Comprsn

there are no decision points in this one

Exprsn

branch 1 → follow(exprsn) = {;,)} ∪ {)} = {;,.)}

branch 2 → {+}

→ {;,.)} ∩ {+} = ∅

Factor

branch 1 → follow(factor) = follow(exprsn) ∪ {+} = {;,.),+}

branch 2 → {*}

→ {;,.),+} ∩ {*} = ∅

Oprnd

branch 1 → first(integer) = first(digit) = {0,1,2,3,4,5,6,7,8,9}

branch 2 → first(ident) = first(letter) = {_,X,Y,Z}

branch 3 → {(}

→ ∅ because all 3 branches are disjoint

Opratr

too trivial to prove

Ident

branch 1 → first(char) = first(digit) ∪ first(letter) = {0,1,2,3,4,5,6,7,8,9,_,X,Y,Z}

branch 2 → follow(ident) = {;,)} ∪ {,,)} ∪ {:,)} ∪ {,,)} ∪ {~,)} ∪ follow(oprnd) = {;,.,~,)} ∪ {)} ∪
first(oprator) ∪ {*,)} ∪ follow(factor) = {;,.,~,),<,=,>,!,*,:,)} + {)}

→ {_,X,Y,Z,0,1,2,3,4,5,6,7,8,9} ∩ {*,),:,+,<,=,>,!,;,)} = ∅

Char

branch 1 → first(digit) = {_,X,Y,Z}

branch 2 → first(letter) = {0,1,2,3,4,5,6,7,8,9}

→ {_,X,Y,Z} ∩ {0,1,2,3,4,5,6,7,8,9} = ∅

Integer

branch 1 → first(digit) = {0,1,2,3,4,5,6,7,8,9}

branch 2 → follow(integer) = follow(oprnd) = first(oprator) ∪ {)} ∪ follow(factor) ∪ {*,)}

→ {0,1,2,3,4,5,6,7,8,9} ∩ {*,),.,+,<,=,>,!,)} = ∅

Letter **Digit**

both are trivial cases, proof is not needed