

Student name: Ngô Quốc Thắng

Student ID: 20194839

Class ID: 126989

Question 1:

Program example 1;

Begin

If $n = +2$ begin then $F := 1$;

End.

\Rightarrow raise error "Invalid Term"

Because 2 sides of condition after "if" must be expression and n is an expression already. We can see after $+2$ we have to compile Term 2 (void), so we can choose KW-BEGIN which not belongs to Follow set or SB-TIMES or SB-SLASH.

Question 3:

We have

(1) $\langle \text{Term2} \rangle ::= \text{SB-TIMES} \langle \text{Factor} \rangle \langle \text{Term2} \rangle$

(2) $\langle \text{Term2} \rangle ::= \text{SB-SLASH} \langle \text{Factor} \rangle \langle \text{Term2} \rangle$

(3) $\langle \text{Term2} \rangle ::= \epsilon$.

$\text{First}_1(1) = \{\text{SB-TIMES}\}$

$\text{First}_1(2) = \{\text{SB-SLASH}\}$

Because $\text{First}_1(3) = \{\epsilon\} \Rightarrow$ we have to check FOLLOW set.

$\text{FOLLOW}_1(\text{Term2}) = \{\text{SB-PLUS}, \text{SB-MINUS}, \text{SB-RPAR}, \text{KW-TO}, \text{KW-PO}, \text{SB-COMMA}, \text{SB-EQ}, \text{SB-NEQ}, \text{SB-LE}, \text{SB-LT}, \text{SB-GE}, \text{SB-GT}, \text{SB-RSEL}, \text{SB-SEMICOLON}, \text{KW-END}, \text{KW-ELSE}, \text{KW-THEN}\}$

$\Rightarrow \text{FIRST}_1(\text{RHS1}) \neq \text{FIRST}_1(\text{RHS2}) \neq \text{FOLLOW}_1(\text{Term2})$

\Rightarrow So, the rule satisfy LL(1) condition

Question 4:

- We have semantic error "A procedure identifier expected".
- Explain.
 - + Because ~~we~~^{you} do like that, when ~~you~~ it goes to compile call st() and function checkDeclaredProcedure(), the lookupObject(name) function will find Hanoi as ~~a~~ variable not a procedure. The reason is that it will catch the closest one in the scope, this case is VAR HANOI : INTEGER;
 - + So that, Obj is found (Obj \neq NULL) but Obj \rightarrow kind is not OBJ_PROCEDURE \Rightarrow ERR_INVALID_PROCEDURE in function checkDeclaredProcedure() will raise.
- In that procedure, we do not know that VAR I is declared or not
 - + If it was declared, but not Integer, so it raises "Type inconsistency" error
 - + If it was declared and it's integer, so nothing happens, no error.
 - + If it is not declared, it raises error "Undeclared identifier".

Question 2:

- ② We add new chars in CharCodes 9 and 10 is CHAR_LSB and CHAR_RSB.
 - If we see CHAR_LSB, we call function readIdentSpaceKeyword (new function).
 - If we see a CHAR_LETTER first it's fine, otherwise \rightarrow error
 - If we see a CHAR_LETTER and after it can be CHAR_LETTER, CHAR_SPACE, CHAR_DIGIT
 - We start to store current Char to token \rightarrow string when first is CHAR_LETTER.
 - At the end of function we have to check it has CHAR_RSB or not ~~it~~
 - + If it has, so it's fine. If not or other character, it will raise error. (except 3 above)
 - Remainder of function readIdentSpaceKeyword is similar to readIdentKeyword function
- ③ In 2 functions readIdentSpaceKeyword and readIdentKeyword.
 - We can add more conditions $\text{if}(\text{count} \geq 15) \{$
 - $\text{token} \rightarrow \text{string}[15] = '\backslash 0';$
 - $\}$ else $\{$
 - $\text{token} \rightarrow \text{string}[\text{count}] = '\backslash 0';$
 - $\}$

\rightarrow only rule 1 and 3 has to be changed.