|  |  |  |
| --- | --- | --- |
| **Grammar** | **First** | **Follow** |
| 1- program -> stmt\_seq | If, id, int, float, char | $ |
| 2- stmt\_seq -> stmt stmt\_seq' | If, id, int, float, char | $,} |
| 3- stmt\_seq' -> stmt\_seq | 3 | if, id, int, float, char, 3 | $, } |
| 4- stmt -> if\_stmt | assign\_stmt ; | declare\_stmt ; | If, id, int, float, char | if, id, int, float, char, $,} |
| 5- if\_stmt -> if ( condition ) { stmt\_seq' } else\_part | If | if, id, int, float, char, $,} |
| 6- else\_part -> else { stmt\_seq' } | 3 | else, 3 | if, id, int, float, char, $,} |
| 7- condition -> exp condition' | (, value, id | ) |
| 8- condition' -> comp\_sign exp | 3 | <, >, ==, >=, <=, !=, 3 | ) |
| 9- comp\_sign -> < | > | == | >= | <= | != | <, >, ==, >=, <=, != | (, value, id |
| 10- exp -> term exp' | (, value, id | <, >, ==, >=, <=, !=, ), ; |
| 11- exp' -> add\_op term exp' | 3 | +, -, 3 | <, >, ==, >=, <=, !=, ), ; |
| 12- add\_op -> + | - | +, - | (, value, id |
| 13- term -> factor term' | (, value, id | +, -, <, >, ==, >=, <=, !=, ), ; |
| 14- term' -> mul\_op factor term' | 3 | \*, /, 3 | +, -, <, >, ==, >=, <=, !=, ), ; |
| 15- mul\_op -> \* | / | \*, / | (, value, id |
| 16- factor -> ( exp ) | value | id | (, value, id | \*, /, +, -, <, >, ==, >=, <=, !=, ), ; |
| 17- declare\_stmt -> datatype id x | Int, float, char | ; |
| 18- x\_stmt -> = exp | 3 | =, 3 | ; |
| 19- assign\_stmt -> id = exp | Id | ; |
| 20- datatype-> int | float | char | Int, float, char | id |

Terminals = if, id, int, float, char, else, (, ), <, >, =, != ,<=, >=, ==, value, \*, /, +, {, }, ;, $

**LL1 parser table**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| line | If | Id | Int | Float | Char | Else | ( | ) | < | > | = | != | <= | >= | == | ; | value | \* | / | + | - | } | $ |
| 1- | 1 | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2- | 2 | 2 | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3- | Stmt\_seq’->stmt\_seq | Stmt\_seq’->stmt\_seq | Stmt\_seq’->stmt\_seq | Stmt\_seq’->stmt\_seq | Stmt\_seq’->stmt\_seq |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Stmt\_seq’->3 | Stmt\_seq’->3 |
| 4- | Stmt-> if\_stmt | stmt->assign\_stmt ; | Stmt->declare\_stmt ; | Stmt->declare\_stmt ; | Stmt->declare\_stmt ; |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5- | 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6- | else\_part->3 | else\_part->3 | else\_part->3 | else\_part->3 | else\_part->3 | else\_part->else{ stmt\_seq’ } |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | else\_part->3 | else\_part->3 |
| 7- |  | 7 |  |  |  |  | 7 |  |  |  |  |  |  |  |  |  | 7 |  |  |  |  |  |  |
| 8- |  |  |  |  |  |  |  | Condition’->3 | condition’->comp\_sign exp | condition’->comp\_sign exp |  | condition’->comp\_sign exp | condition’->comp\_sign exp | condition’->comp\_sign exp | condition’->comp\_sign exp |  |  |  |  |  |  |  |  |
| 9- |  |  |  |  |  |  |  |  | comp\_sign-> < | comp\_sign-> > |  | comp\_sign-> != | comp\_sign-> <= | comp\_sign-> >= | comp\_sign-> == |  |  |  |  |  |  |  |  |
| 10- |  | 10 |  |  |  |  | 10 |  |  |  |  |  |  |  |  |  | 10 |  |  |  |  |  |  |
| 11- |  |  |  |  |  |  |  | exp’-> 3 | exp’-> 3 | exp’-> 3 |  | exp’-> 3 | exp’-> 3 | exp’-> 3 | exp’-> 3 | exp’-> 3 |  |  |  | exp’->add\_op term exp’ | exp’->add\_op term exp’ |  |  |
| 12- |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | add\_op-> + | add\_op-> - |  |  |
| 13- |  | 13 |  |  |  |  | 13 |  |  |  |  |  |  |  |  |  | 13 |  |  |  |  |  |  |
| 14- |  |  |  |  |  |  |  | Term’->3 | Term’->3 | Term’->3 |  | Term’->3 | Term’->3 | Term’->3 | Term’->3 | Term’->3 |  | Term->mul\_op factor term’ | Term->mul\_op factor term’ | Term’->3 | Term’->3 |  |  |
| 15- |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | mul\_op->\* | mul\_op->/ |  |  |  |  |
| 16- |  | Factor->id |  |  |  |  | Factor->( exp ) |  |  |  |  |  |  |  |  |  | Factor->value |  |  |  |  |  |  |
| 17- |  |  | 17 | 17 | 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18- |  |  |  |  |  |  |  |  |  |  | x\_stmt-> = exp |  |  |  |  | x\_stmt-> 3 |  |  |  |  |  |  |  |
| 19- |  | 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  | datatype->int | Datatype->float | datatype->char |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |