To be simplify, I converted it to this abbreviation to put it in table

PROGRAM  a

BEGIN  b

END.  $

INTEGER  i

PRINT  t

P  p

Q  q

R  r

S  s

<prog>  X

<identifier>  A

<dec-list>  D

<stat-list>  L

<more-id-digit>  M

<dec>  C

<type>  Y

<stat>  Z

<print>  H

<assign>  G

<exp>  E

<term>  T

<factor>  F

<number>  N

<sign>  O

<more-digit>  K

<digit>  J

<id>  I

**BNF form in abbreviated words:**

X  a A ; D b L $

A  I M

M  J M

M  **λ**

D  Y : C ;

C  A , C

Here I marked as \*

C  A

* \* these 2 lines above will be written like this to prevent 2 states in same table

W  A W

W  , C | **λ**

Y  i

L  Z

Here I marked as \*

L  Z L

* \* these 2 lines above will be written like this to prevent 2 states in same table

L  Z S

S  λ | L

Z H

Z G

H  t ( A )

G  A = E ;

E  E + T

E  E - T

Here I marked as \*

E  T

* I called new state is Q

E  T Q

Q  + T Q

Q  - T Q

Q  λ

T  T \* F

T  T / F

Here I marked as \*

T  F

* I called new state is R

T  F R

R  \* F R

R  / F R

R  λ

F  A

F  N

F  ( E )

N  O J K

O  + | - | λ

K  J K

K  λ

J  **0 1 2 3 4 5 6 7 8 9**

I  p | q | r | s

|  |  |  |
| --- | --- | --- |
| **STATE** | **FIRST** | **FOLLOW** |
| **X** | **a** | **$** |
| **A** | **p q r s** | **; , ) = \* / + -** |
| **M** | **λ  p q r s 0 1 2 3 4 5 6 7 8 9** | **; , ) = \* / + -** |
| **D** | **i** | **b** |
| **C** | **p q r s** | **;** |
| **Y** | **i** | **:** |
| **L** | **t  p q r s** | **$** |
| **Z** | **t  p q r s $** | **t  p q r s $** |
| **H** | **t** | **t  p q r s $** |
| **G** | **p q r s** | **t  p q r s $** |
| **E** | **p q r s + - 0 1 2 3 4 5 6 7 8 9 (** | **; )** |
| **New state Q** | **+ - λ** | **; )** |
| **New state R** | **\* / λ** | **; ) + -** |
| **T** | **p q r s + - 0 1 2 3 4 5 6 7 8 9 (** | **; ) + -** |
| **F** | **p q r s + - 0 1 2 3 4 5 6 7 8 9 (** | **; ) \* / + -** |
| **N** | **+ - 0 1 2 3 4 5 6 7 8 9** | **; ) \* / + -** |
| **O** | **+ - λ** | **0 1 2 3 4 5 6 7 8 9** |
| **K** | **λ 0 1 2 3 4 5 6 7 8 9** | **\* / + - ; )** |
| **J** | **0 1 2 3 4 5 6 7 8 9** | **p q r s 0 1 2 3 4 5 6 7 8 9 ; , ) = \* / + -** |
| **I** | **p q r s** | **p q r s 0 1 2 3 4 5 6 7 8 9 ; , ) = \* / + -** |
| **New state W** | **, λ** | **;** |
| **New state S** | **λ t  p q r s** | **$** |

**BNF form :**

<prog>  PROGRAM <identifier> ; <dec-list> BEGIN <stat-list> END.

<identifier>  <id> <more-id-digit>

<more-id-digit>  <digit> <more-id-digit>

<more-id-digit>  <id> <more-id-digit>

<more-id-digit>   **λ**

<dec-list>  <type> : <dec> ;

<dec>  <identifier> , <dec>

<dec>  <identifier>

<type>  INTEGER

<stat-list>  <stat>

<stat-list>  <stat> <stat-list>

<stat>  PRINT

<stat>  <assign>

<print>  PRINT ( <identifier> ) ;

<assign>  <identifier> = <exp> ;

<exp>  <exp> + <term>

<exp>  <exp> - <term>

<exp>  <term>

<term>  <term> \* <factor>

<term>  <term> / <factor>

<term>  <factor>

<factor>  <identifier>

<factor>  <number>

<factor>  ( <exp> )

<number>  <sign> <digit> <more-digit>

<sign>  +

<sign>  -

<sign>  **λ**

<more-digit>  <digit> <more-digit>

<more-digit>  **λ**

<digit>  0

<digit>  1

<digit>  2

<digit>  3

<digit>  4

<digit>  5

<digit>  6

<digit>  7

<digit>  8

<digit>  9

<id>  P

<id>  Q

<id>  R

<id>  S

|  |  |  |
| --- | --- | --- |
| **STATE** | **FIRST** | **FOLLOW** |
| **<prog>** | **PROGRAM** | **END.** |
| **<identifier>** | **P Q R S** | **; , ) = \* / + -** |
| **<more-id-digit>** | **λ  P Q R S 0 1 2 3 4 5 6 7 8 9** | **; , ) = \* / + -** |
| **<dec-list>** | **INTEGER** | **BEGIN** |
| **<dec>** | **P Q R S** | **;** |
| **<type>** | **INTEGER** | **:** |
| **<stat-list>** | **PRINT  P Q R S** | **END.** |
| **<stat>** | **PRINT  P Q R S** | **PRINT  P Q R S END.** |
| **<print>** | **PRINT** | **PRINT  P Q R S END.** |
| **<assign>** | **P Q R S** | **PRINT  P Q R S END.** |
| **<expr>** | **P Q R S + - 0 1 2 3 4 5 6 7 8 9 (** | **; )** |
| **New state Q** | **+ - λ** | **; )** |
| **New state R** | **\* / λ** | **; ) + -** |
| **<term>** | **P Q R S + - 0 1 2 3 4 5 6 7 8 9 (** | **; ) + -** |
| **<factor>** | **P Q R S + - 0 1 2 3 4 5 6 7 8 9 (** | **; ) \* / + -** |
| **<number>** | **+ - 0 1 2 3 4 5 6 7 8 9** | **; ) \* / + -** |
| **<sign>** | **+ - λ** | **0 1 2 3 4 5 6 7 8 9** |
| **<more-digit>** | **λ 0 1 2 3 4 5 6 7 8 9** | **\* / + - ; )** |
| **<digit>** | **0 1 2 3 4 5 6 7 8 9** | **P Q R S 0 1 2 3 4 5 6 7 8 9 ; , ) = \* / + -** |
| **<id>** | **P Q R S** | **P Q R S 0 1 2 3 4 5 6 7 8 9 ; , ) = \* / + -** |
| **New state W** | **, λ** | **;** |
| **New state S** | **λ PRINT  P Q R S** | **END.** |