1. a)

1. V é um conjunto finito denominado variáveis;

2. Σ é um conjunto finito, distinto de V , denominado terminais;

3. R é um conjunto finito de regras, com cada regra sendo uma variável e uma cadeia de variáveis e terminais;

4. S ∈ V é a variável inicial.

b)

S -> TT | U

T -> 0T | T0 | #

U -> 0U00 | #

Passo 1:

S0 -> S

S -> TT | U

T -> 0T | T0 | #

U -> 0U00 | #

Passo 2:

S0 -> S

S -> TT | U

T -> 0T | T0 | # | TU | UT | T

U -> 0U00 | #

S0 -> S

S -> TT | U | e

T -> 0T | T0 | # | TU | UT | T | UU

U -> 0U00

S0 -> S

S -> TT | U | e

T -> 0T | T0 | TU | UT | T | UU

U -> 0U00

Passo 3:

S0 -> S | 0T | T0 | TU | UT | T | UU

S -> TT | U

T -> 0T | T0 | TU | UT | T | UU

U -> 0U00

S0 -> 0T | T0 | TU | UT | T | UU | 0U00

S -> TT | U

T -> 0T | T0 | TU | UT | T | UU

U -> 0U00

Passo 4:

S0 -> 0T | T0 | TU | UT | T | UU | 0U00

S -> TT | U

T -> 0T | T0 | TU | UT | T | UU

U -> 0U00

U1 -> TU

U0 -> 0

2)

Passo 1:

S0 -> S

S → aSb | bY | Ya

Y → bY | aY | e

Passo 2:

S0 -> S

S → aSb | bY | Ya

Y → bY | aY | e

S0 -> S

S → aSb | bY | Ya |a | e

Y → bY | aY

S0 -> S

S → aSb | bY | Ya |a | e | Y

Y → bY | aY

Passo 3:

S0 -> S | aSb | bY | Ya |a |Y

S → aSb | bY | Ya |a |Y

Y → bY | aY

S0 -> aSb | bY | Ya |a |Y | bY | aY

S → aSb | bY | Ya |a |Y

Y → bY | aY

Passo 4:

S0 -> aSb | bY | Ya |a | bY | aY

S → aSb | bY | Ya |a |Y

Y → bY | aY

Y1 -> SY

S0 -> aSb | bY | Ya |a | bY | aY

S → aSb | bY | Ya |a |Y

Y → bY | aY

Y1 -> SY

U0 -> a

3)