LR(1) for

$E \leftarrow T \dashv$

$T \leftarrow F$

$T \leftarrow T * F$

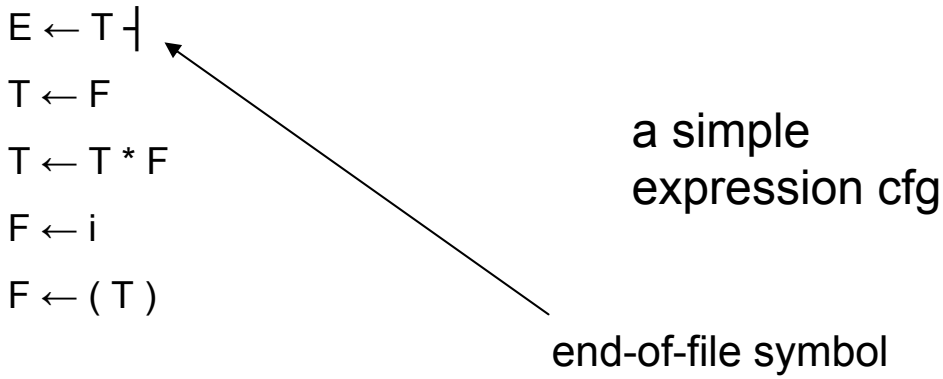
$F \leftarrow i$

$F \leftarrow (T)$

Bill McKeeman

Dartmouth

April 18, 2008


E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)
a simple
expression cfg
end-of-file symbol

E ← ▫ T ⊣

LR start state

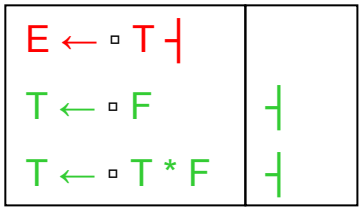
E ← T ⊣

T ← F

T ← T * F

F ← i

F ← (T)



marked rules

lookahead

E ← T ⊣

T ← F

T ← T * F

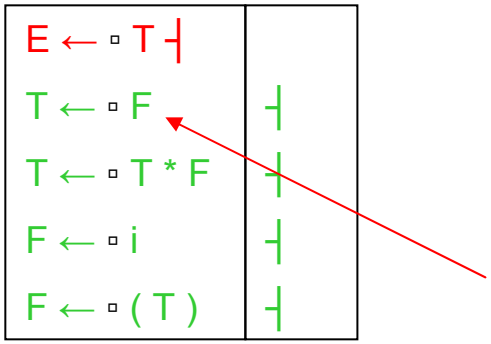
F ← i

F ← (T)

closure for T

kernel in red

closure in green



E ← T ⊣

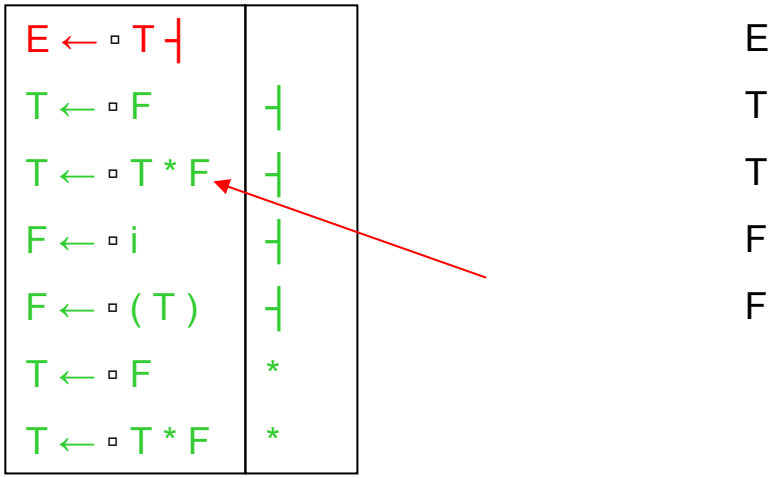
T ← F

T ← T * F

F ← i

F ← (T)

closure for F



E ← T ⊣

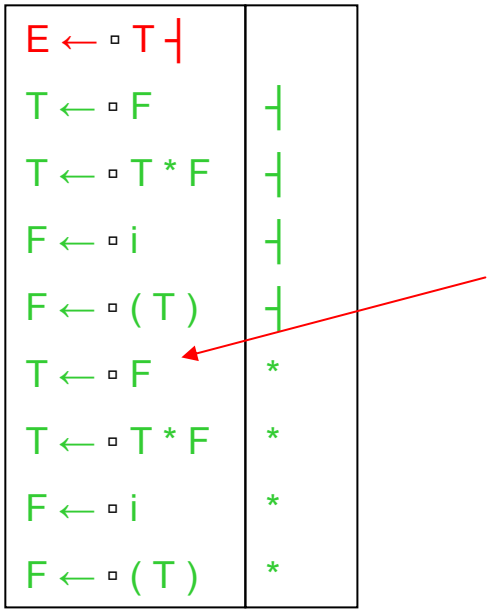
T ← F

T ← T * F

F ← i

F ← (T)

another closure for T



E ← T ⊣

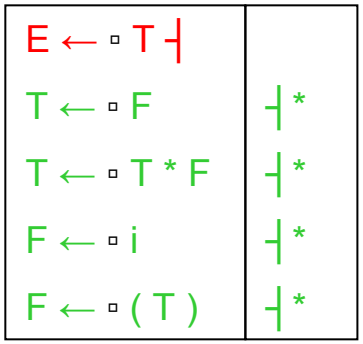
T ← F

T ← T * F

F ← i

F ← (T)

another closure for F



E ← T ┤

T ← F

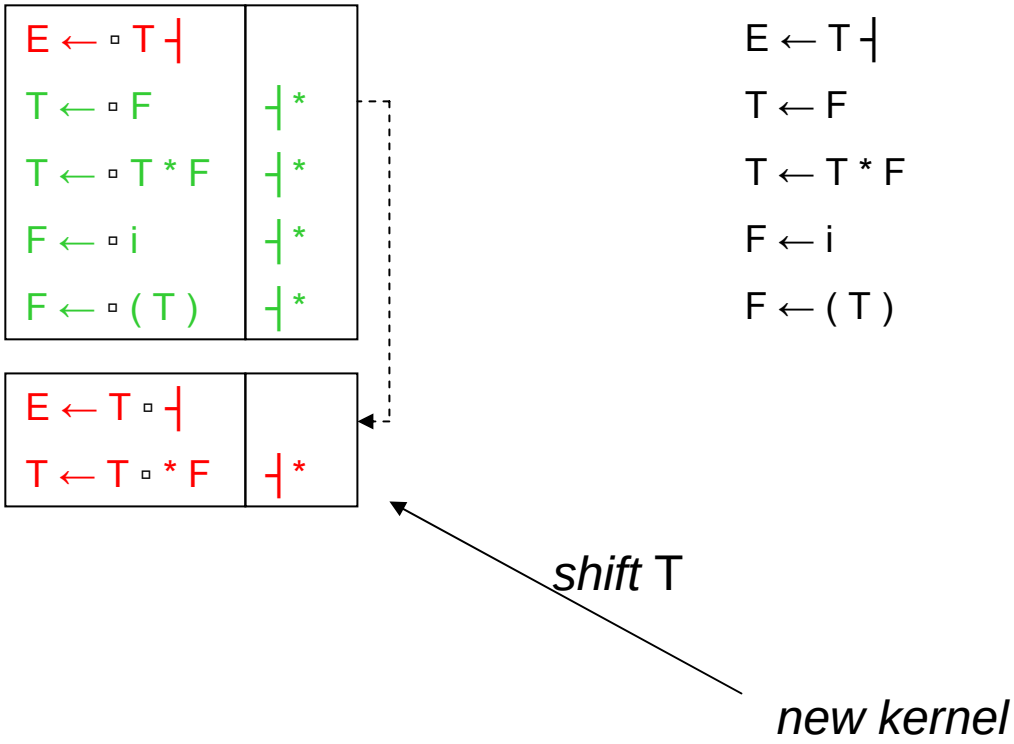
T ← T * F

F ← i

F ← (T)

merge lookaheads

closure complete



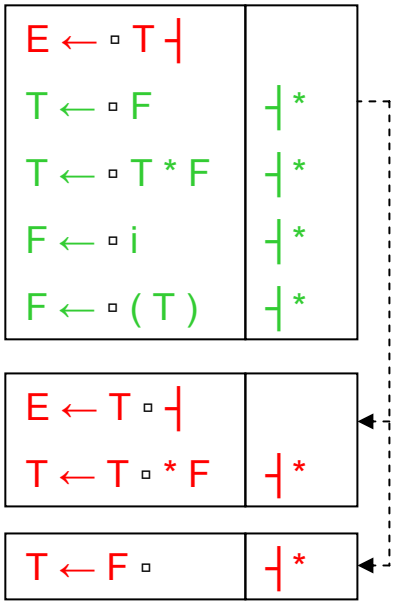
E ← T ┤

T ← F

T ← T * F

F ← i

F ← (T)



E ← T ┤

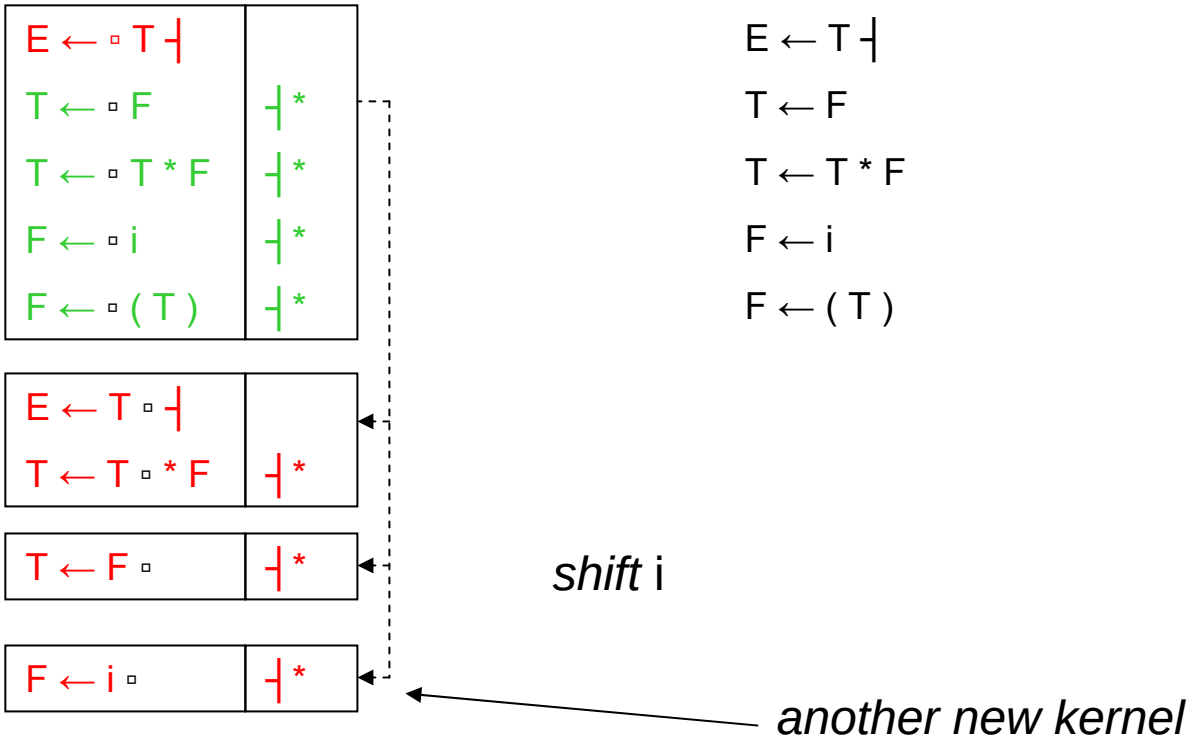
T ← F

T ← T * F

F ← i

F ← (T)

another new kernel



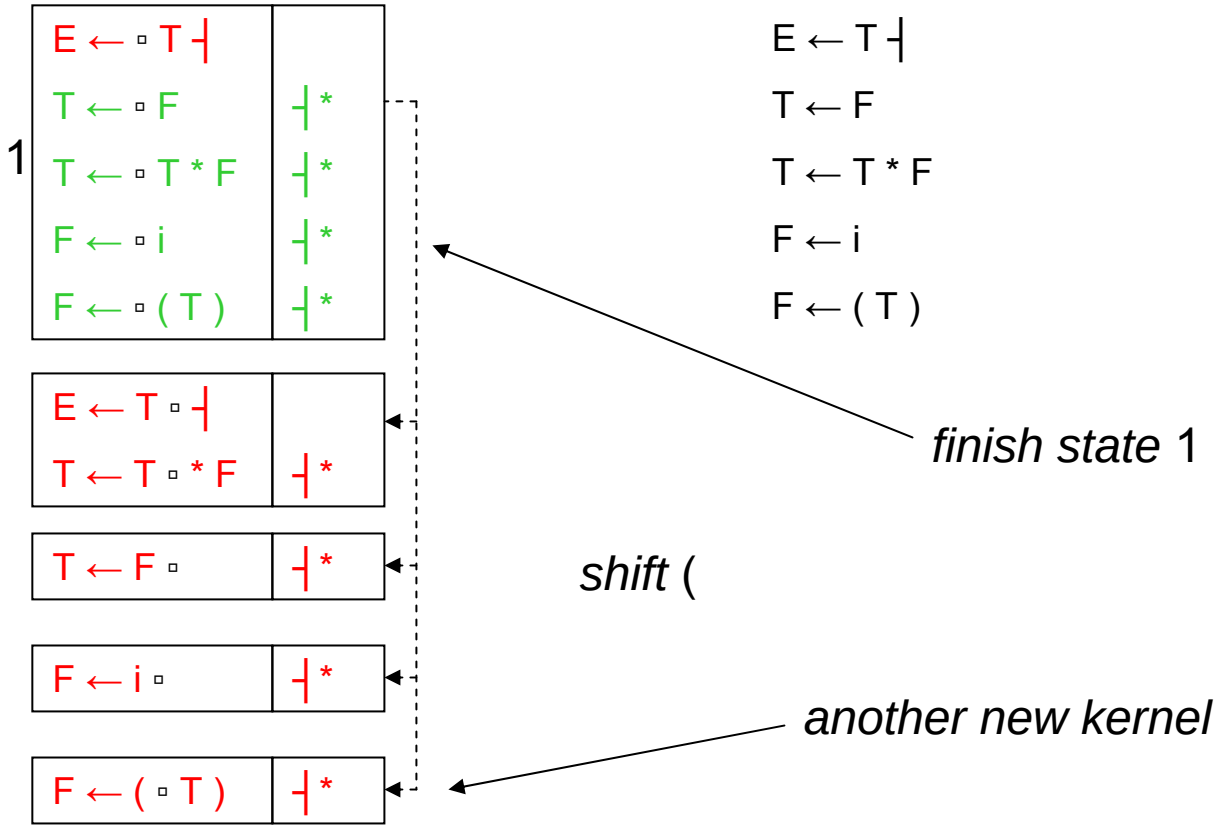
E ← T ┤

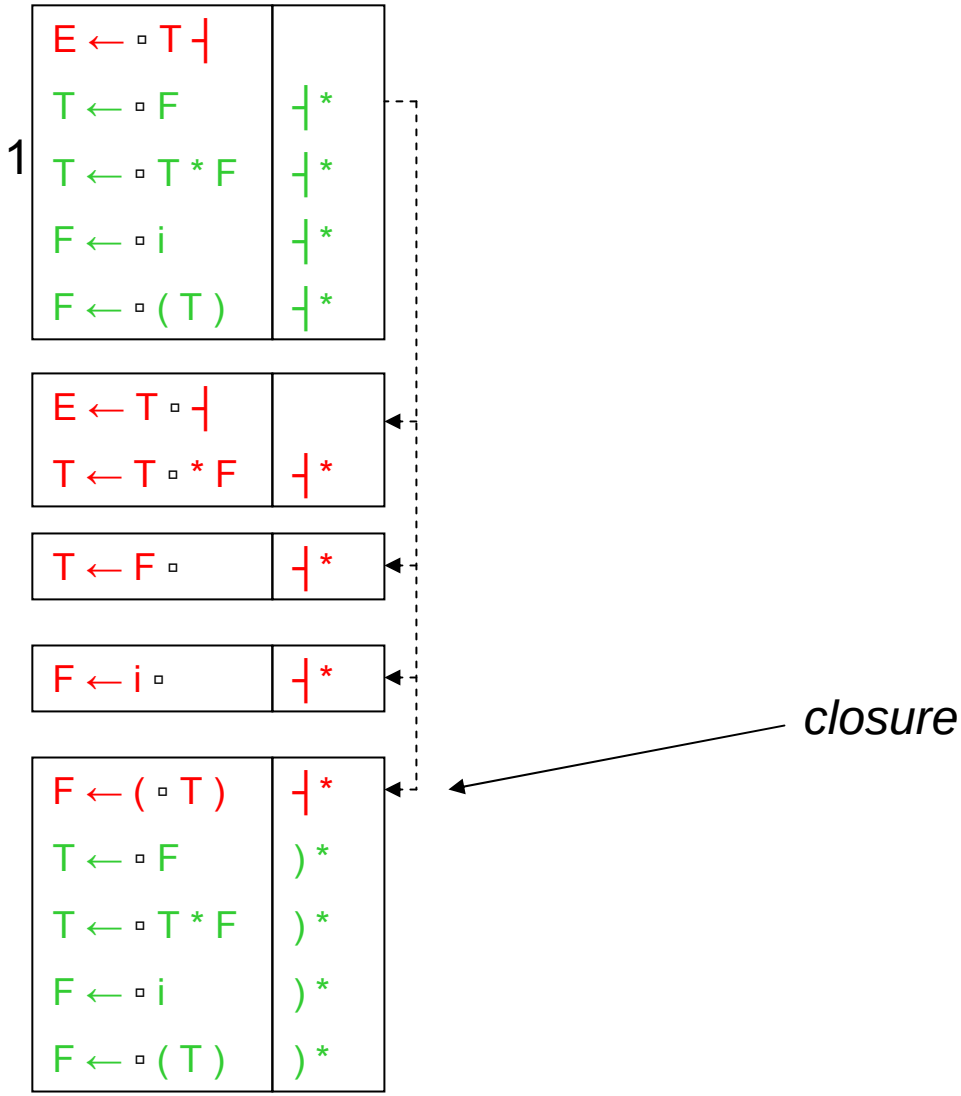
T ← F

T ← T * F

F ← i

F ← (T)


1
E ← ▫ T ┤
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
┤*
E ← T ▫ ┤
T ← T ▫ * F
T ← F ▫
F ← i ▫
F ← (▫ T)
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)
finish state 1
shift (
another new kernel



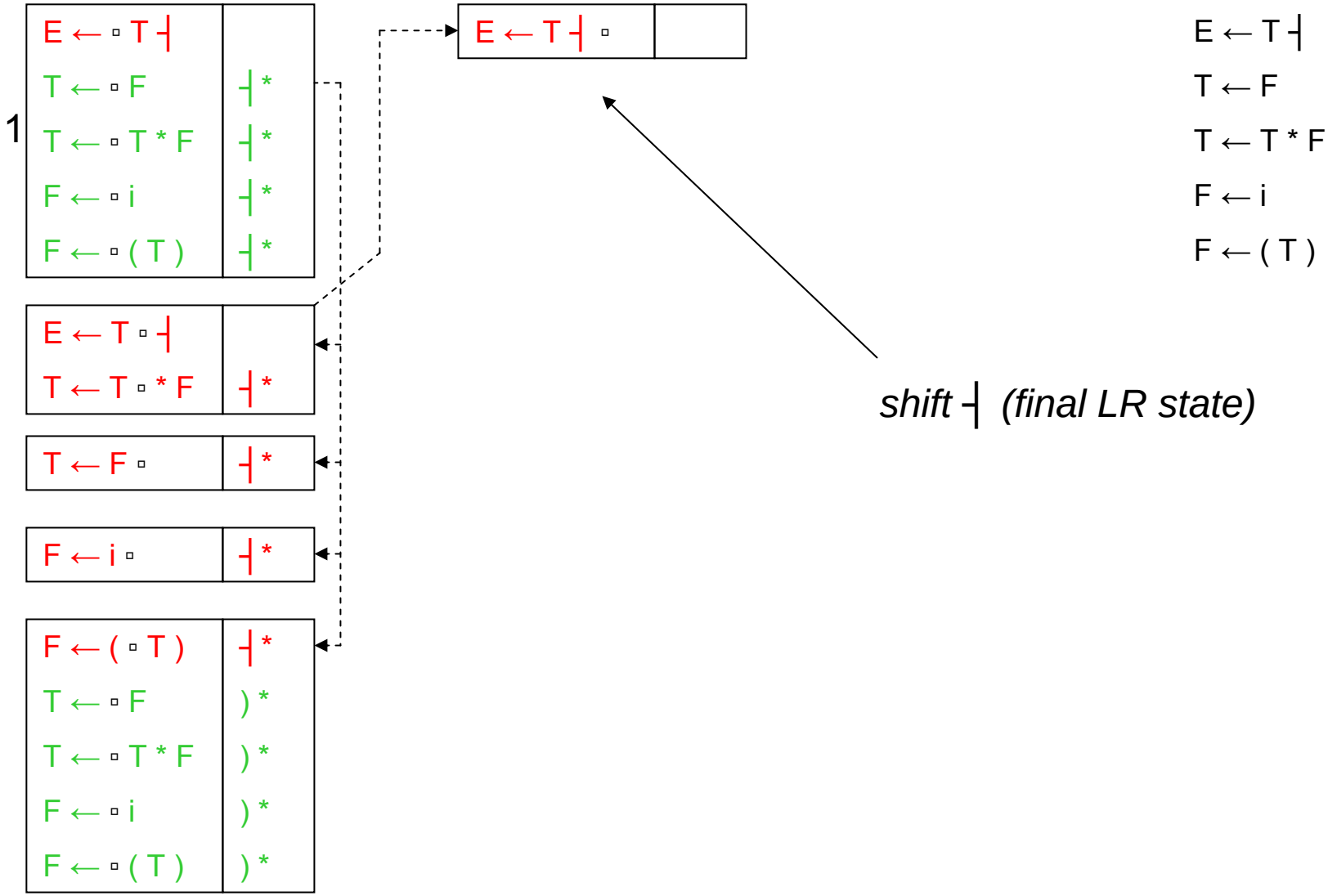
E ← T ⊣

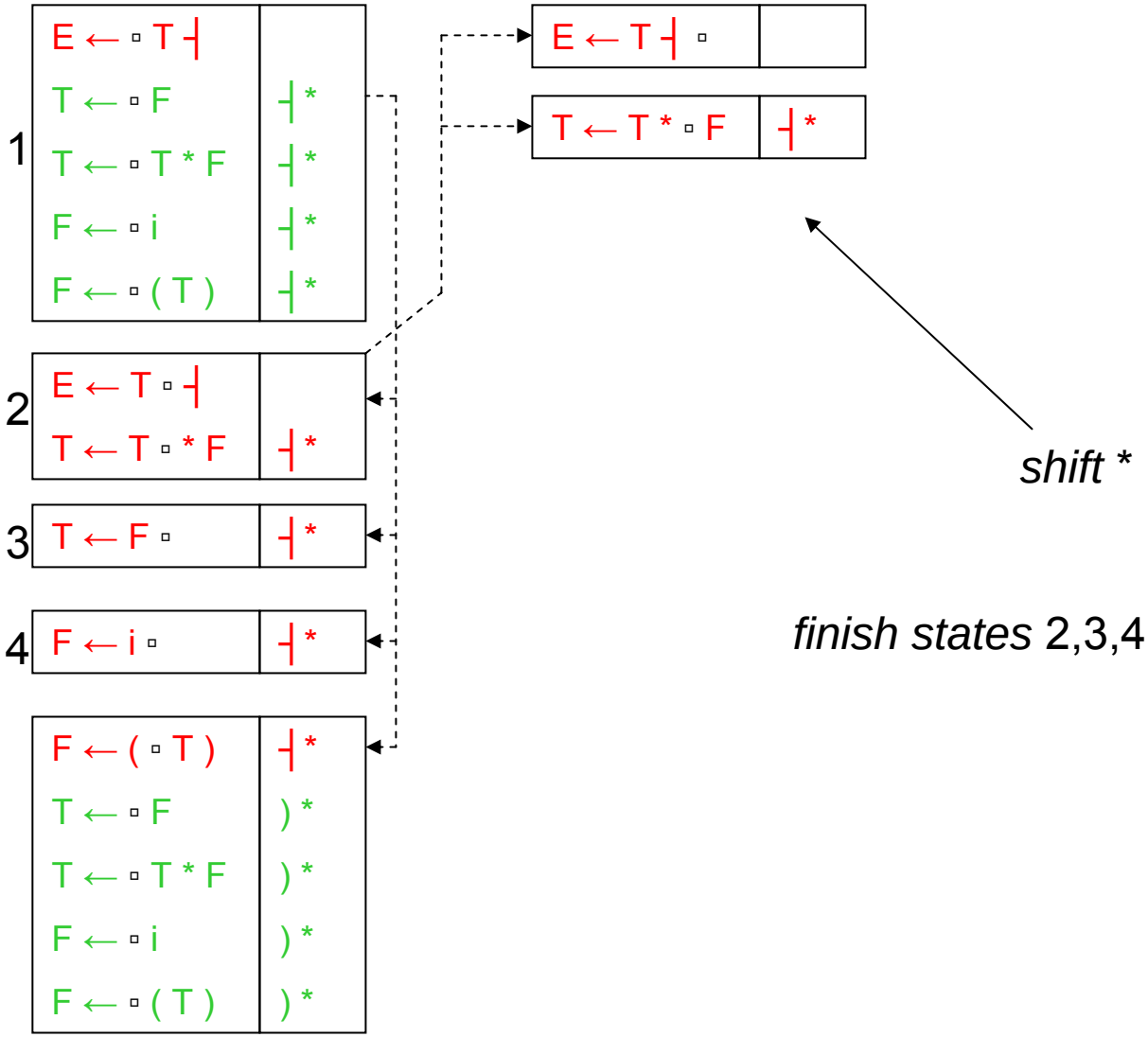
T ← F

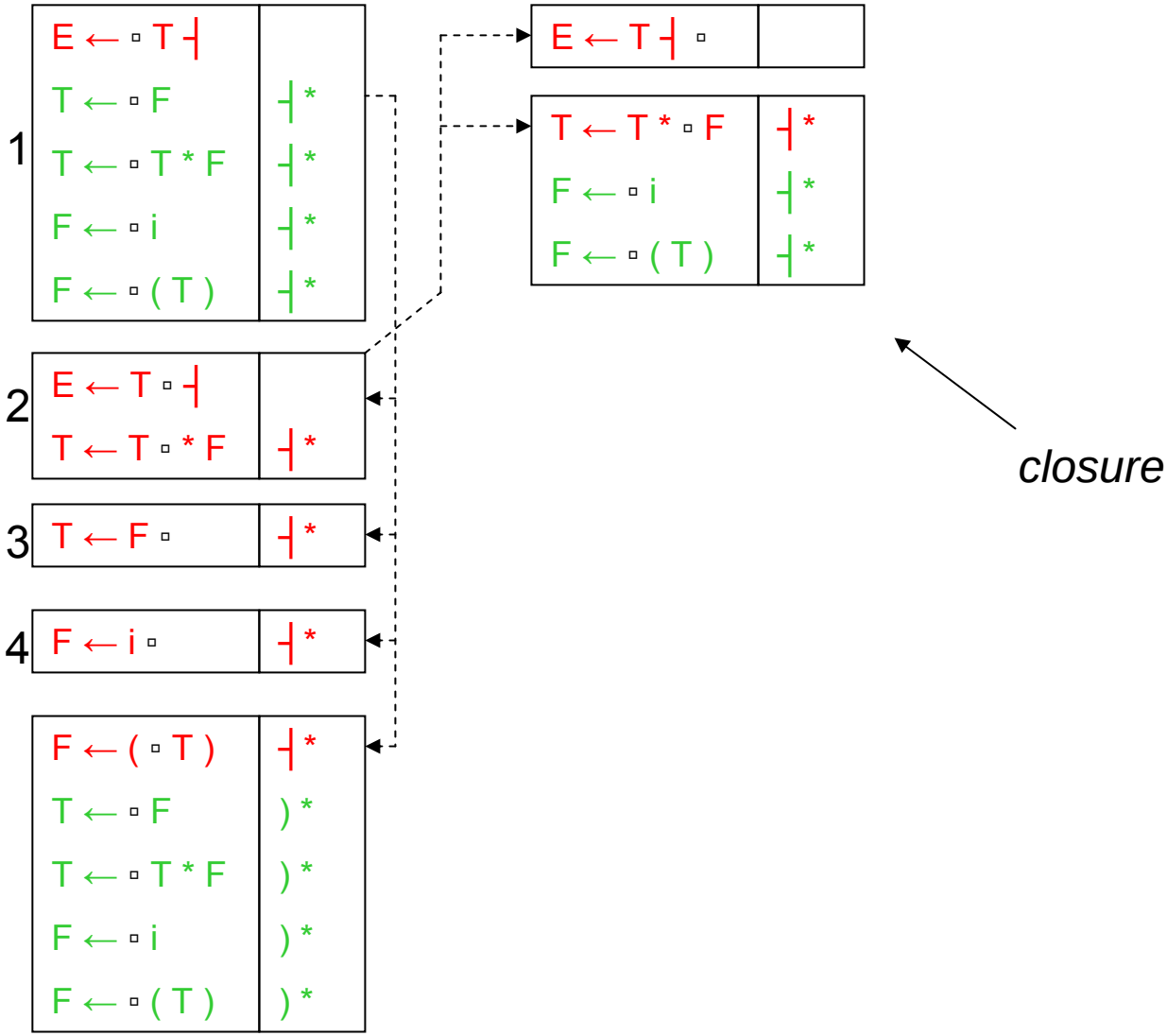
T ← T * F

F ← i

F ← (T)


1
E ← ▫ T ⊣
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
⊣ *
E ← T ▫ ⊣
T ← T ▫ * F
E ← T ⊣ ▫
T ← F ▫
F ← i ▫
F ← (▫ T)
) *
E ← T ⊣
T ← F
T ← T * F
F ← i
F ← (T)
shift ⊣ (final LR state)


1
E ← ▫ T ┤
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
┤*
2
E ← T ▫ ┤
T ← T ▫ * F
3
T ← F ▫
4
F ← i ▫
E ← T ┤ ▫
T ← T * ▫ F
F ← (▫ T)
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
)*
shift *
finish states 2,3,4
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)



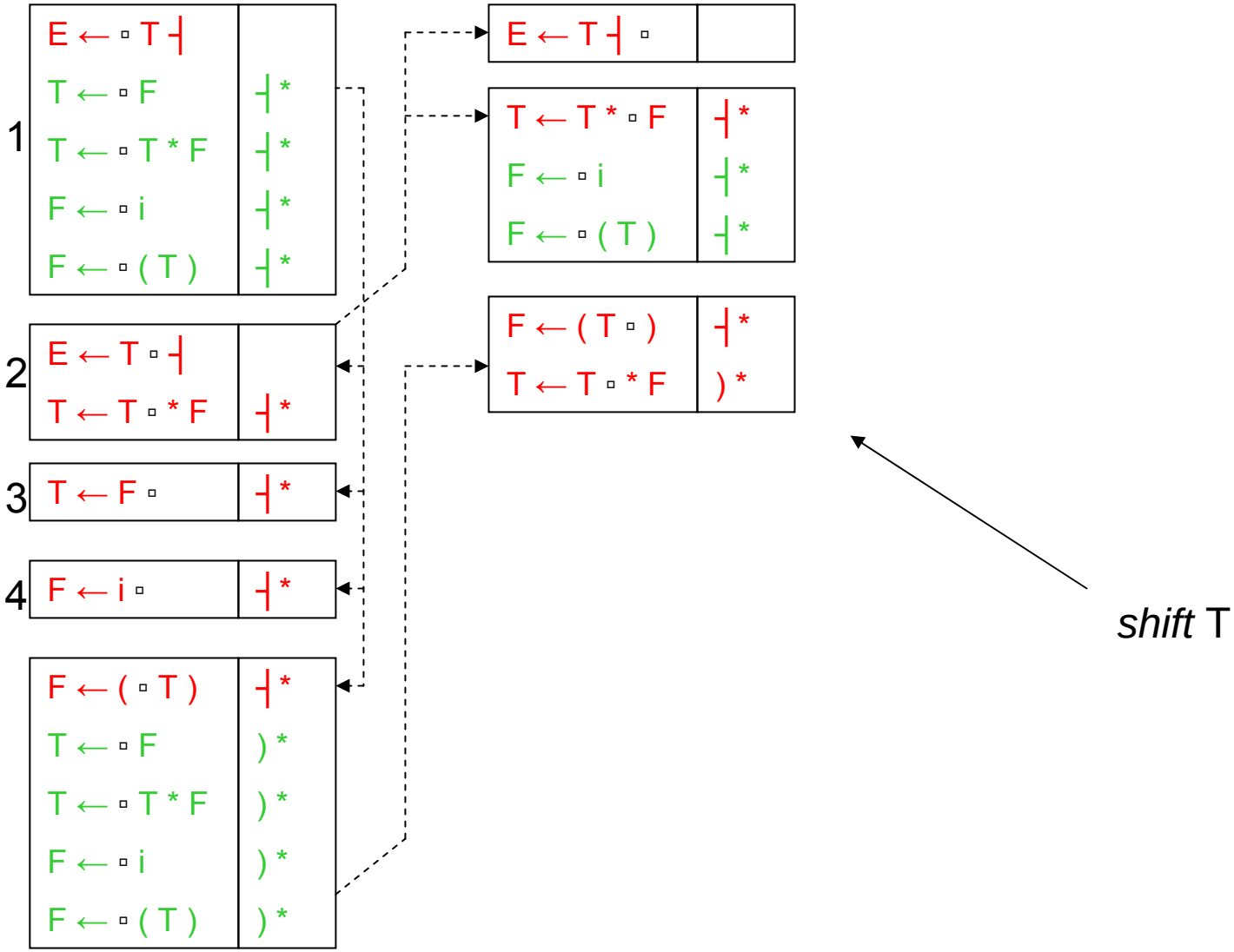
E ← T ⊣

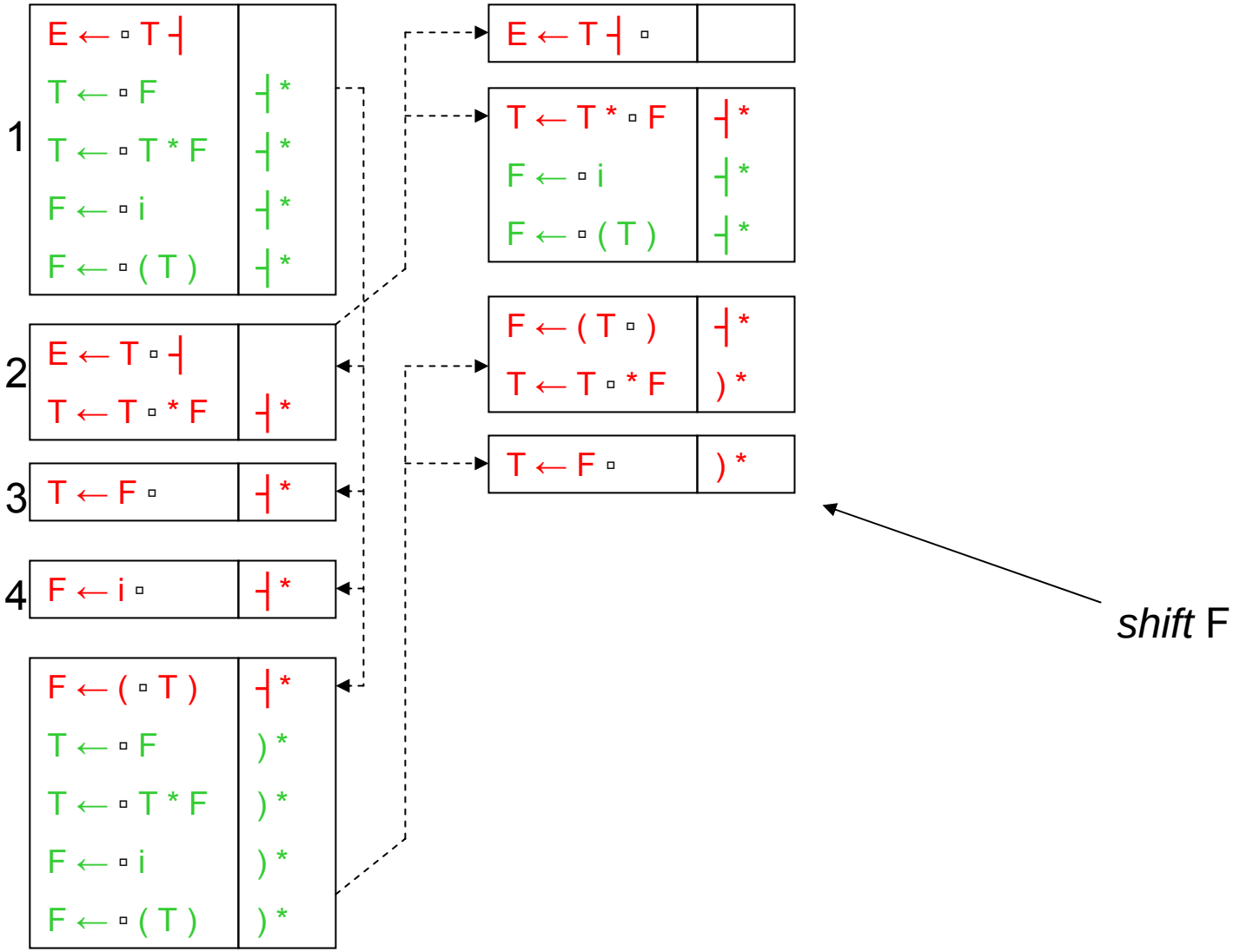
T ← F

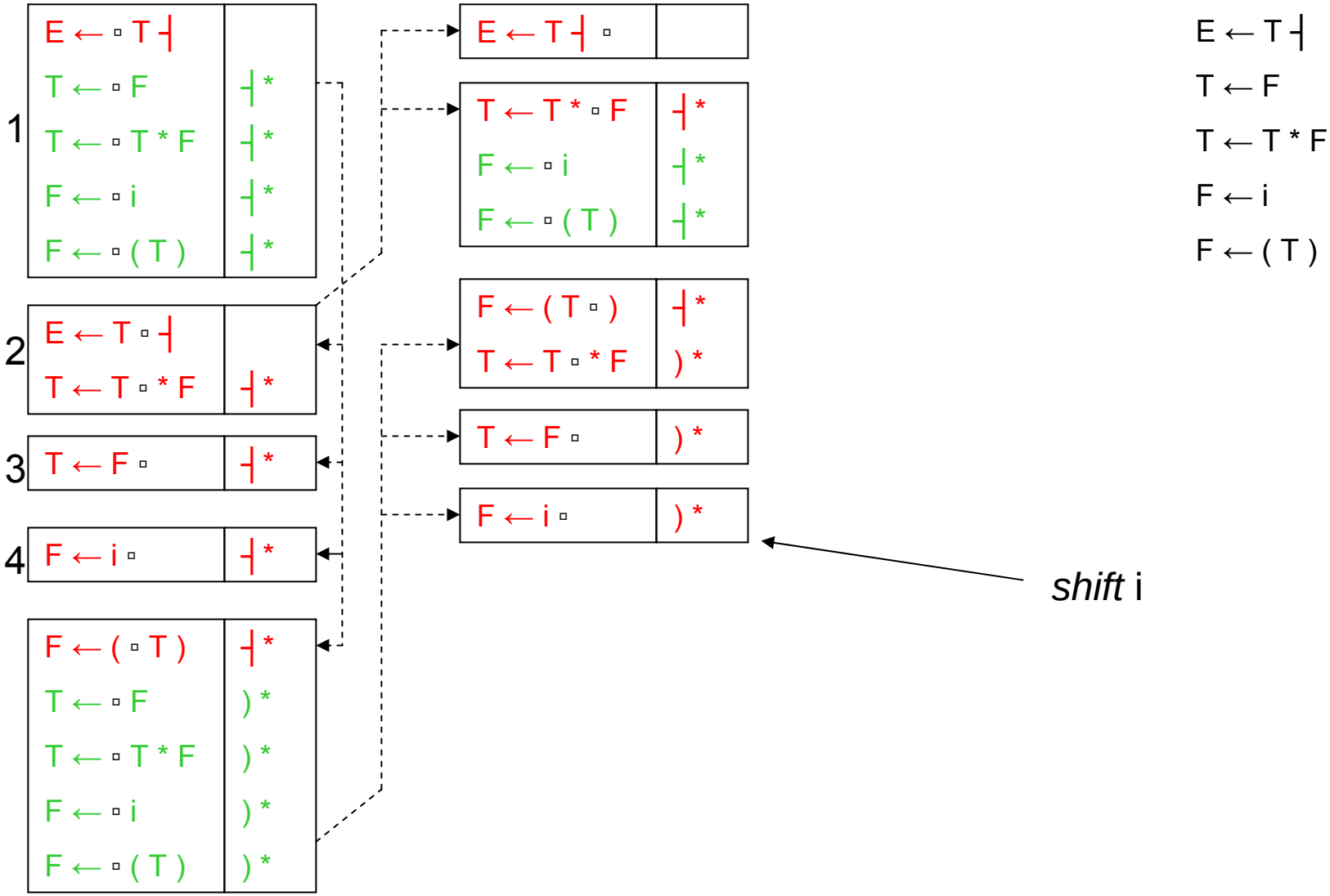
T ← T * F

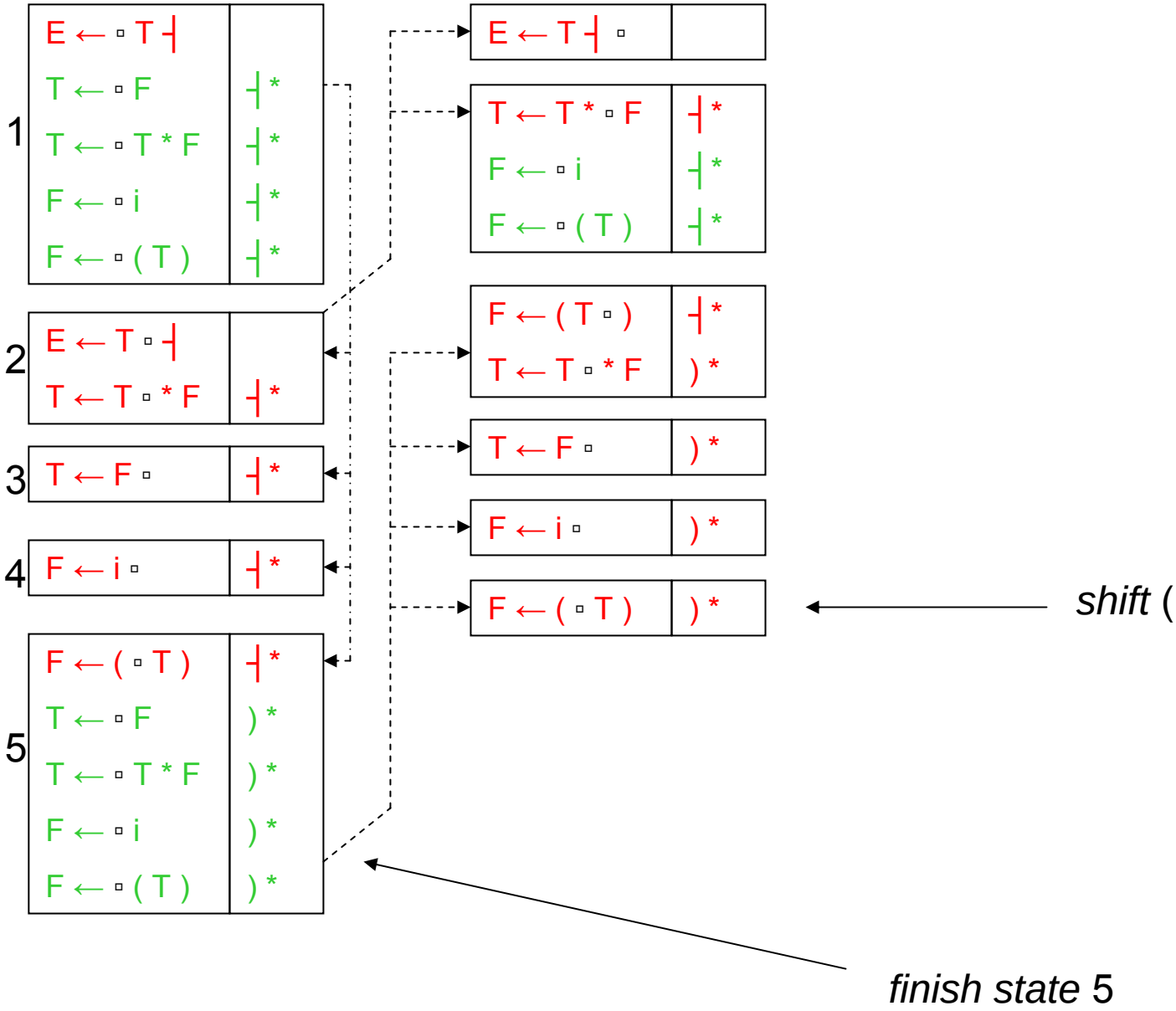
F ← i

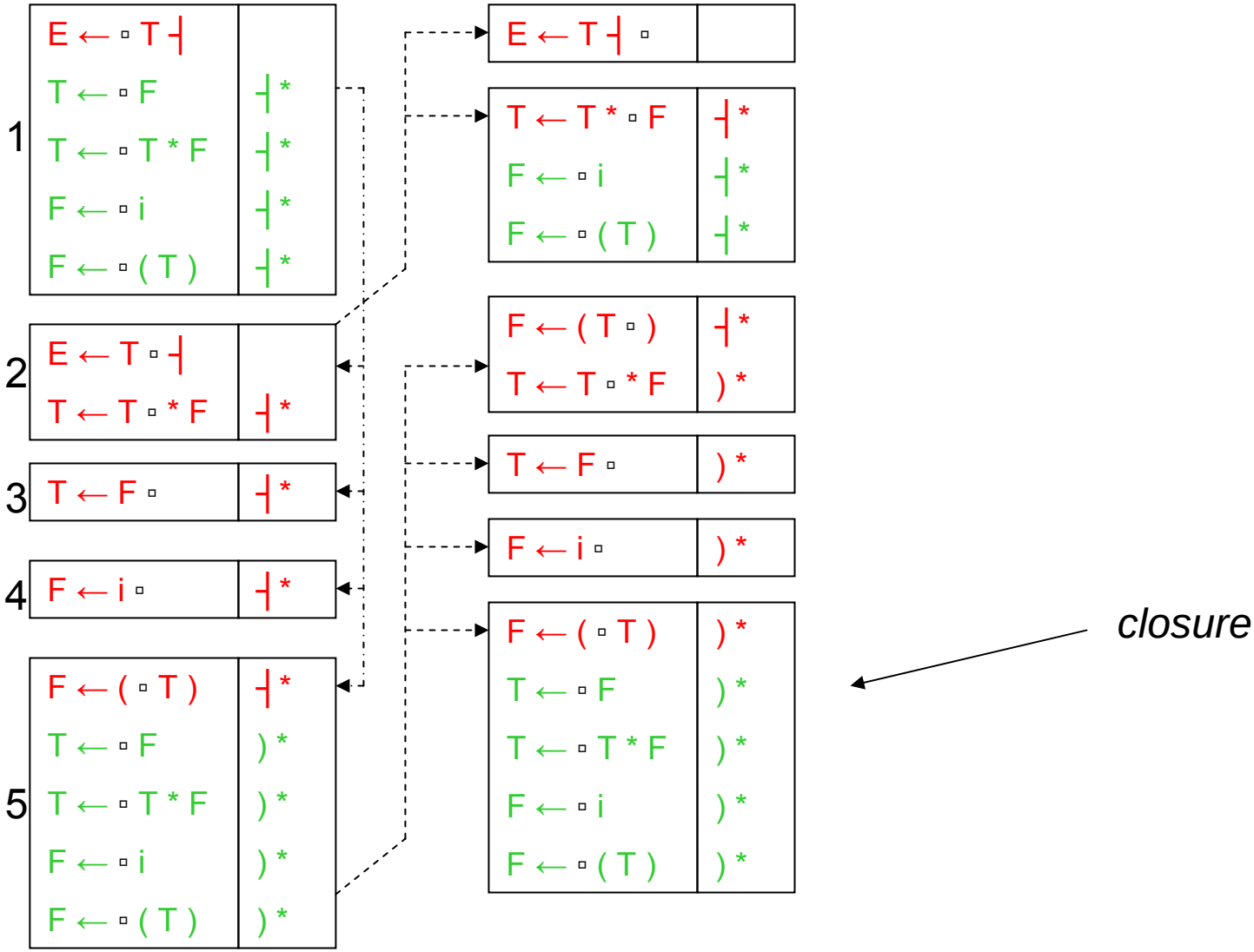
F ← (T)


1
E ← ▫ T ┤
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
┤*
2
E ← T ▫ ┤
T ← T ▫ * F
3
T ← F ▫
4
F ← i ▫
E ← T ┤ ▫
T ← T * ▫ F
F ← ▫ i
F ← ▫ (T)
F ← (T ▫)
T ← T ▫ * F
)*
F ← (▫ T)
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)
shift T


1
E ← ▫ T ┤
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
┤*
2
E ← T ▫ ┤
T ← T ▫ * F
3
T ← F ▫
4
F ← i ▫
E ← T ┤ ▫
T ← T * ▫ F
F ← ▫ i
F ← ▫ (T)
F ← (T ▫)
T ← T ▫ * F
)*
T ← F ▫
F ← (▫ T)
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)
shift F


1
E ← ▫ T ⊣
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
⊣ *
2
E ← T ▫ ⊣
T ← T ▫ * F
3
T ← F ▫
4
F ← i ▫
E ← T ⊣ ▫
T ← T * ▫ F
F ← ▫ i
F ← ▫ (T)
F ← (T ▫)
T ← T ▫ * F
) *
T ← F ▫
F ← i ▫
F ← (▫ T)
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
E ← T ⊣
T ← F
T ← T * F
F ← i
F ← (T)
shift i


1
E ← ▫ T ┤
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
┤*
2
E ← T ▫ ┤
T ← T ▫ * F
3
T ← F ▫
4
F ← i ▫
5
F ← (▫ T)
T ← ▫ F
T ← ▫ T * F
F ← ▫ i
F ← ▫ (T)
)*
E ← T ┤ ▫
T ← T * ▫ F
F ← ▫ i
F ← ▫ (T)
F ← (T ▫)
T ← T ▫ * F
T ← F ▫
F ← i ▫
F ← (▫ T)
shift (
finish state 5
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)



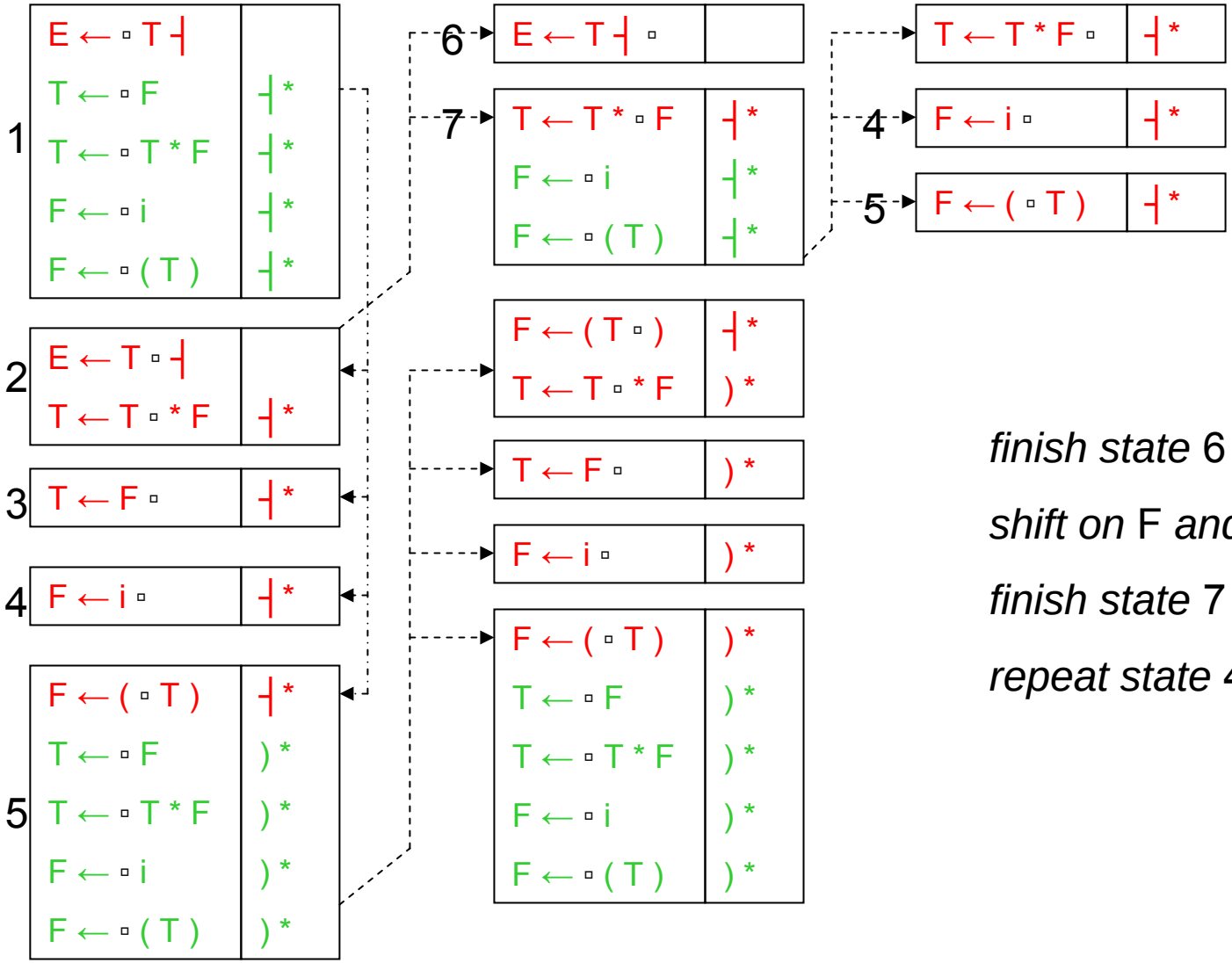
E ← T ┤

T ← F

T ← T * F

F ← i

F ← (T)



E ← T ┤

T ← F

T ← T * F

F ← i

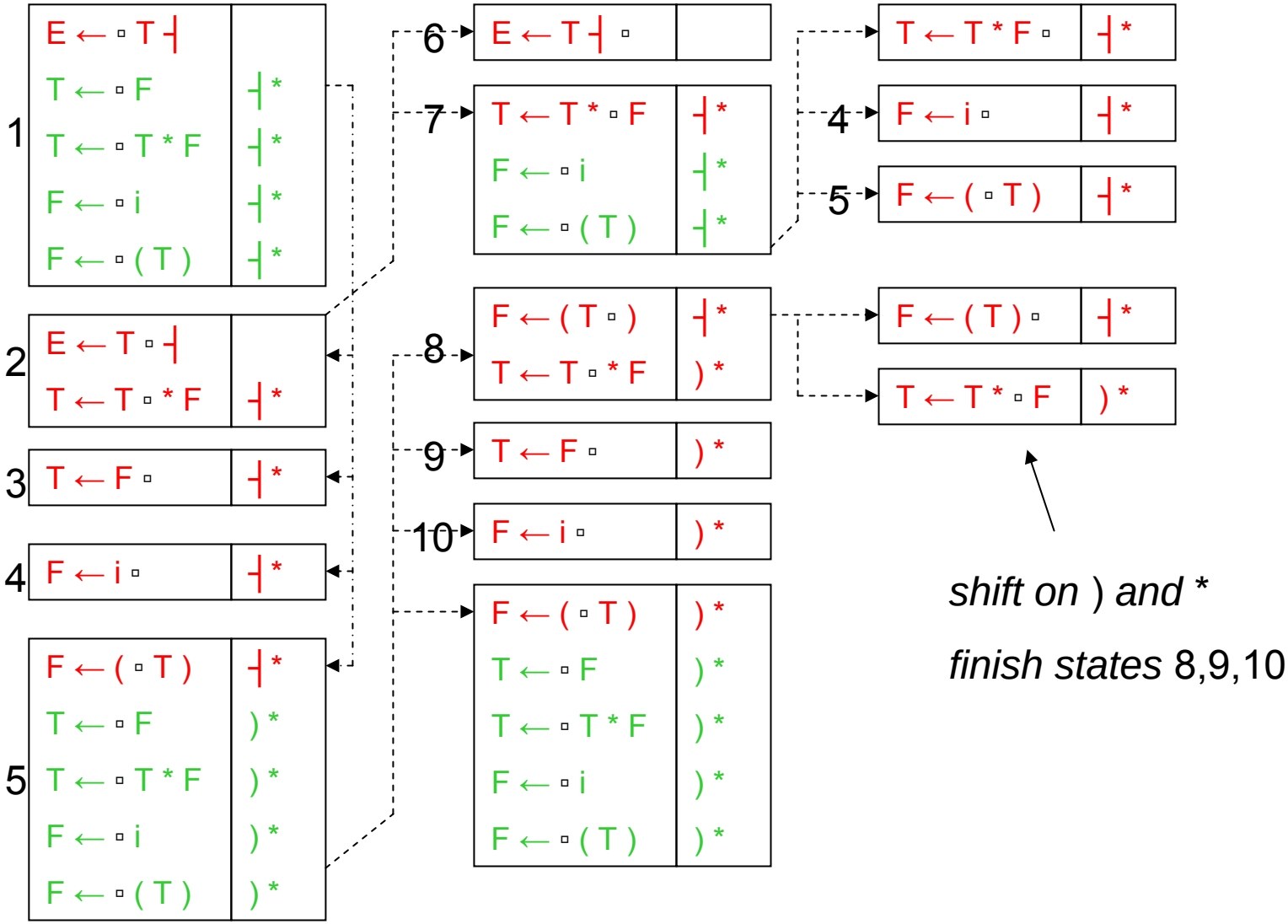
F ← (T)

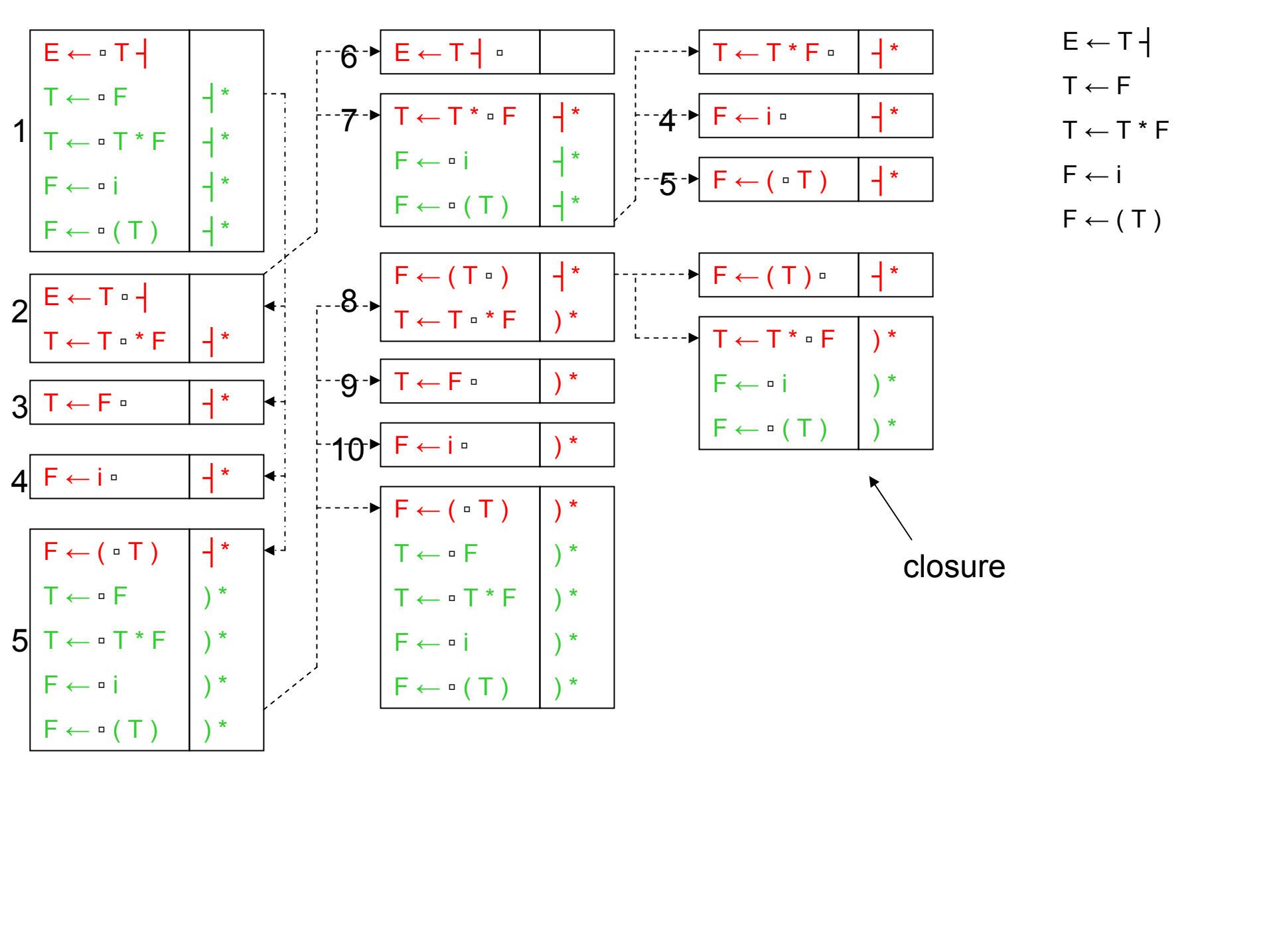
finish state 6

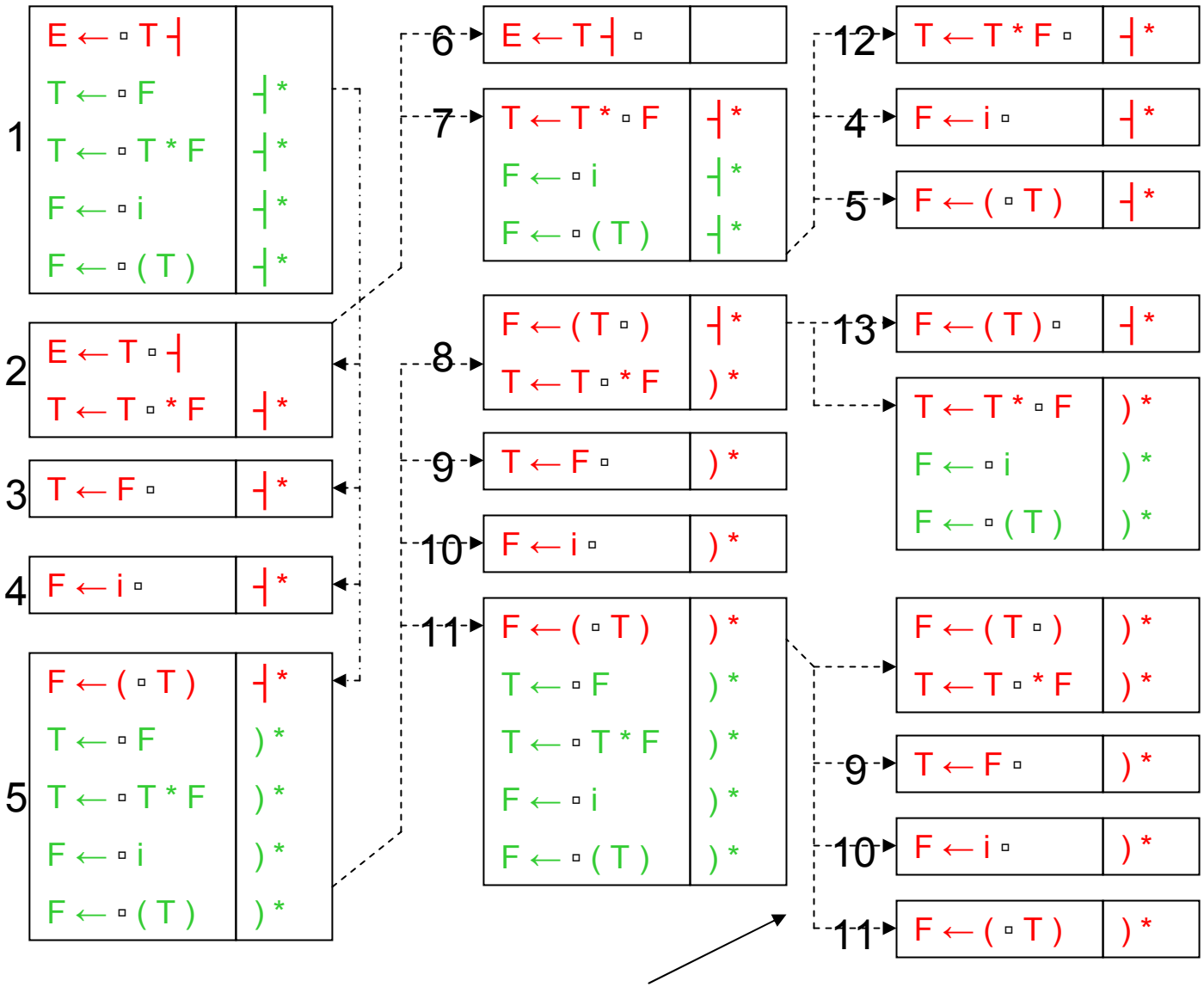
shift on F *and* I *and* (

finish state 7

repeat state 4 *and* 5


1
E ← ▫ T ⊣ |
T ← ▫ F ⊣ *
T ← ▫ T * F ⊣ *
F ← ▫ i ⊣ *
F ← ▫ (T) ⊣ *
2
E ← T ▫ ⊣ |
T ← T ▫ * F ⊣ *
3
T ← F ▫ ⊣ *
4
F ← i ▫ ⊣ *
5
F ← (▫ T) ⊣ *
T ← ▫ F) *
T ← ▫ T * F) *
F ← ▫ i) *
F ← ▫ (T)) *
6
E ← T ⊣ | ▫
7
T ← T * ▫ F ⊣ *
F ← ▫ i ⊣ *
F ← ▫ (T) ⊣ *
8
F ← (T ▫) ⊣ *
T ← T ▫ * F) *
9
T ← F ▫) *
10
F ← i ▫) *
F ← (▫ T)) *
T ← ▫ F) *
T ← ▫ T * F) *
F ← ▫ i) *
F ← ▫ (T)) *
4
T ← T * F ▫ ⊣ *
4
F ← i ▫ ⊣ *
5
F ← (▫ T) ⊣ *
F ← (T) ▫ ⊣ *
T ← T * ▫ F) *
shift on) and *
finish states 8,9,10
E ← T ⊣ |
T ← F
T ← T * F
F ← i
F ← (T)


E ← ▫ T ┤
T ← ▫ F ┤*
T ← ▫ T * F ┤*
F ← ▫ i ┤*
F ← ▫ (T) ┤*
1
E ← T ▫ ┤
T ← T ▫ * F ┤*
2
T ← F ▫ ┤*
3
F ← i ▫ ┤*
4
F ← (▫ T) ┤*
T ← ▫ F)*
T ← ▫ T * F)*
F ← ▫ i)*
F ← ▫ (T))*
5
E ← T ┤ ▫
6
T ← T * ▫ F ┤*
F ← ▫ i ┤*
F ← ▫ (T) ┤*
7
F ← (T ▫) ┤*
T ← T ▫ * F)*
8
T ← F ▫)*
9
F ← i ▫)*
10
F ← (▫ T))*
T ← ▫ F)*
T ← ▫ T * F)*
F ← ▫ i)*
F ← ▫ (T))*
T ← T * F ▫ ┤*
4
F ← i ▫ ┤*
5
F ← (T) ▫ ┤*
T ← T * ▫ F)*
F ← ▫ i)*
F ← ▫ (T))*
closure
E ← T ┤
T ← F
T ← T * F
F ← i
F ← (T)



E ← T ┤

T ← F

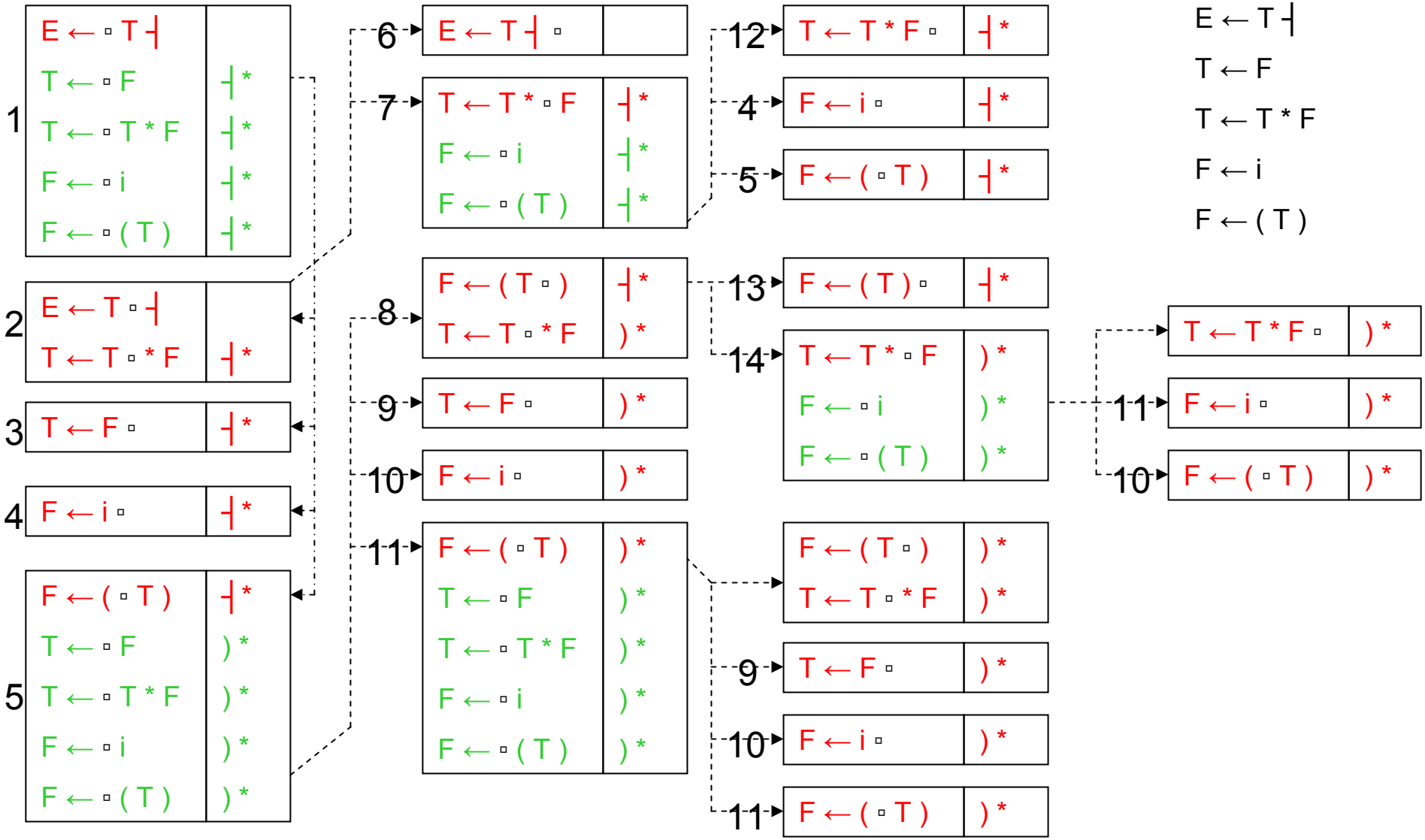
T ← T * F

F ← i

F ← (T)

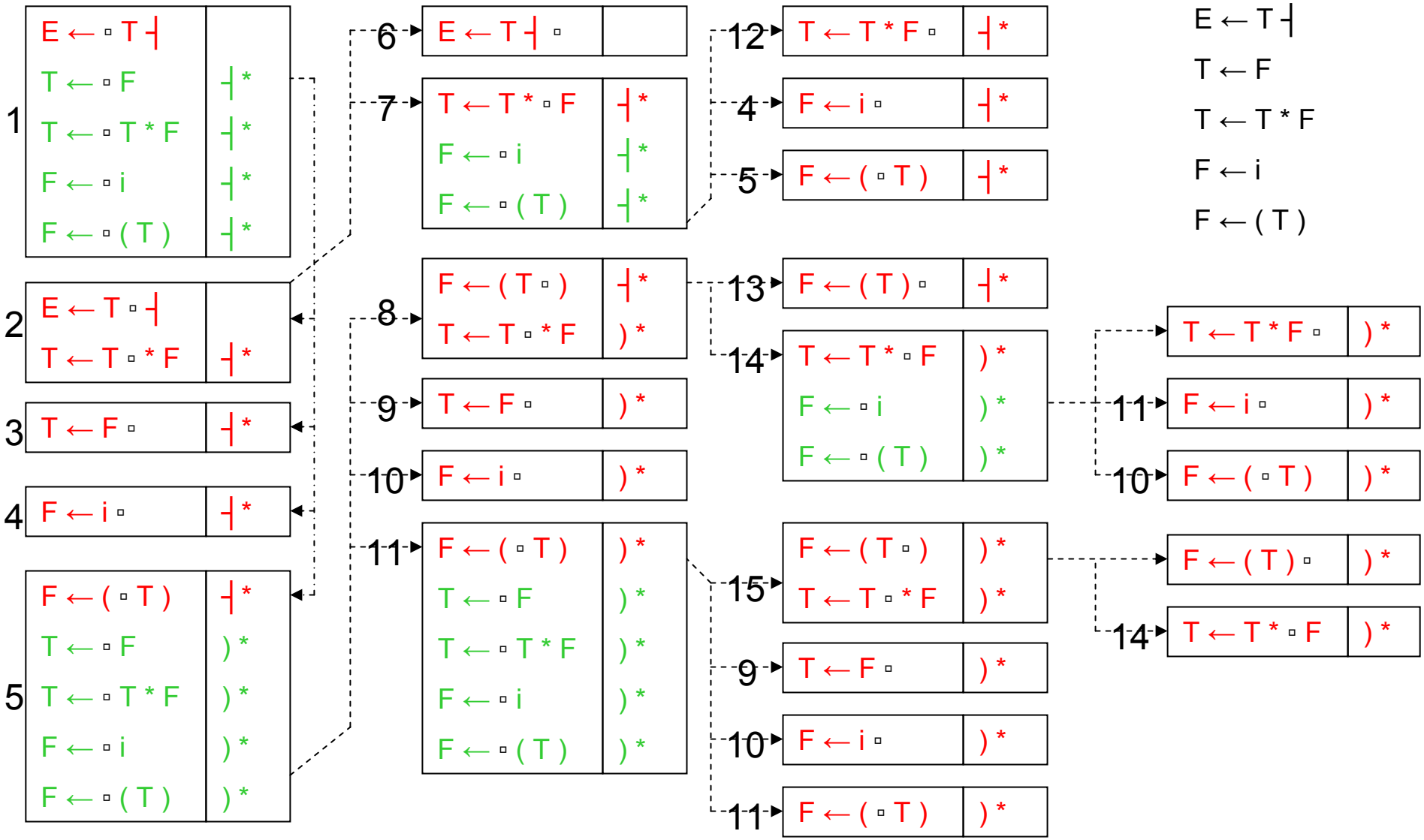
shift on T *and* F *and* i *and* (

finish state 11, *repeat states* 9,10,11, *finish states* 12,13

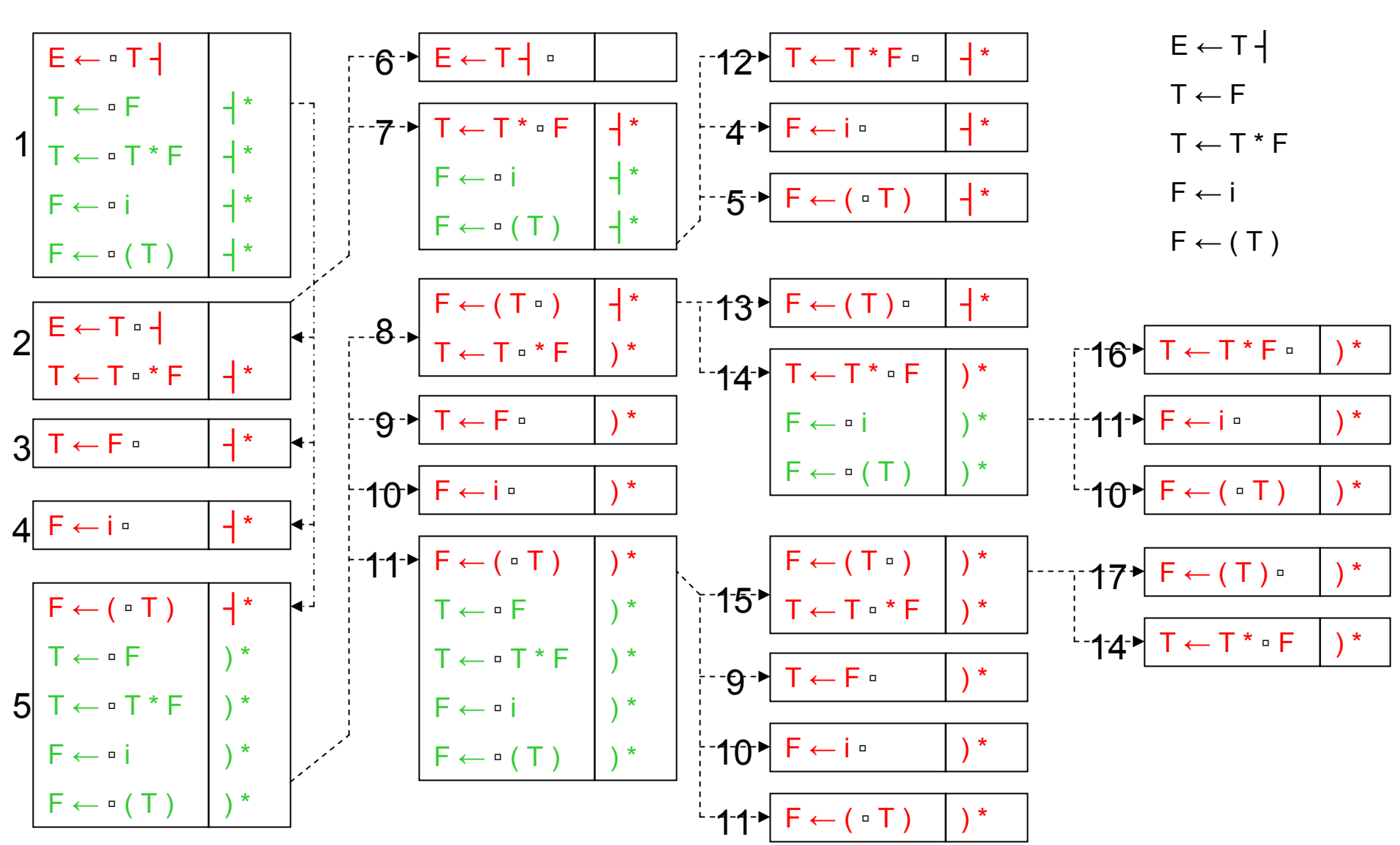


shift on F *and* i *and* (

finish state 14, *repeat states* 10,11



shift) *and* *, *finish state* 15, *repeat state* 14



finish states 16,17

The LR Matrix

symbols

states

	E	T	F	⊣	i	*	(	)
1		2	3		4		5	
2				6		7		
3				-2		-2		
4				-4		-4		
5		8	9		10		11	
6	-1	-1	-1	-1	-1	-1	-1	-1
7			12		4		5	
8			14					13
9						-2		-2
10						-4		-4
11		15	9		10		11	
12				-3		-3		
13				-5		-5		
14			16		11		10	
15						14		17
16						-3		-3
17						-5		-5

-1: $E \leftarrow T \dashv$

-2: $T \leftarrow F$

-3: $T \leftarrow T * F$

-4: $F \leftarrow i$

-5: $F \leftarrow (T)$

stack	input
$_1$	i * i ⊣
$_1i_4$	* i ⊣
$_1F$	* i ⊣
$_1F_3$	* i ⊣
$_1T$	* i ⊣
$_1T_2$	* i ⊣
$_1T_2{}^*{}_7$	i ⊣
$_1T_2{}^*{}_7i_4$	⊣
$_1T_2{}^*{}_7F$	⊣
$_1T_2{}^*{}_7F_{12}$	⊣
$_1T$	⊣
$_1T_2$	⊣
$_1T_2\dashv_6$	
E	