

Bottom up parsing (Shift Reduce parsing):-

→ Shift Reduce parsing is a process of reducing a string to the start symbol of a grammar.

→ It uses a stack to hold the grammar & an I/P to hold the string.

A string  $\xrightarrow{\text{Reduce}}$  the starting symbol.

→ Shift-Reducing parsing performs two actions.

① Shift      ② Reduce.

→ Shift action, the current symbol in the I/P string is pushed on stack.

→ At each reduction, the symbol will be replaced by the non-terminals.

→ The symbol is the right side of production  
 & non-terminal is the left side of the  
 production.

Ex1: grammar

- $S \rightarrow S+S$
- $S \rightarrow S-S$
- $S \rightarrow (S)$
- $S \rightarrow a$

I/P string

$$a_1 - (a_2 + a_3)$$

Stack	I/P string	Action
\$	$a_1 - (a_2 + a_3)$	shift $a_1$
$\$ a_1 \leftarrow$	$- (a_2 + a_3) \$$	reduce by $S \rightarrow a$
$\$ S$	$- (a_2 + a_3) \$$	shift -
$\$ S -$	$a_2 + a_3) \$$	shift $a_2$
$\$ S - ($	$+ a_3) \$$	reduced by $S \rightarrow a$
$\$ S - (a_2$	$+ a_3) \$$	shift +
$\$ S - (S$	$a_3) \$$	shift $a_3$
$\$ S - (S +$	$) \$$	<del>shift</del> reduced by $S \rightarrow S+S$
$\$ S - (S + a_3$	$) \$$	
$\$ S - (S + (S)$	$\$$	reduced by $S \rightarrow (S)$
$\$ S - (S)$	$\$$	reduced by $S \rightarrow S-S$
$\$ S - S$	$\$$	reduced $S \rightarrow S-S$
$\$$	$\$$	Accept pair

Ex2:  $E \rightarrow 2E2$   
 $E \rightarrow 3E3$   
 $E \rightarrow 4$

1/p string 32423.

Stack	1/p string	Action.
empty stack. <del>3</del> \$	32423 \$	shift 3.
\$3	2423 \$	shift 2.
\$32	423 \$	shift 4.
\$324	23 \$	Reduce $E \rightarrow 4$ .
$\rightarrow$ \$32E	23 \$	shift 2.
$\rightarrow$ \$32E2	3 \$	Reduce $E \rightarrow 2E2$ .
$\rightarrow$ \$3E	3 \$	shift 3.
$\rightarrow$ \$3E3	\$	Reduce $E \rightarrow 3E3$ .
$\rightarrow$ \$E	\$	Accept the string.

Types of parsing