

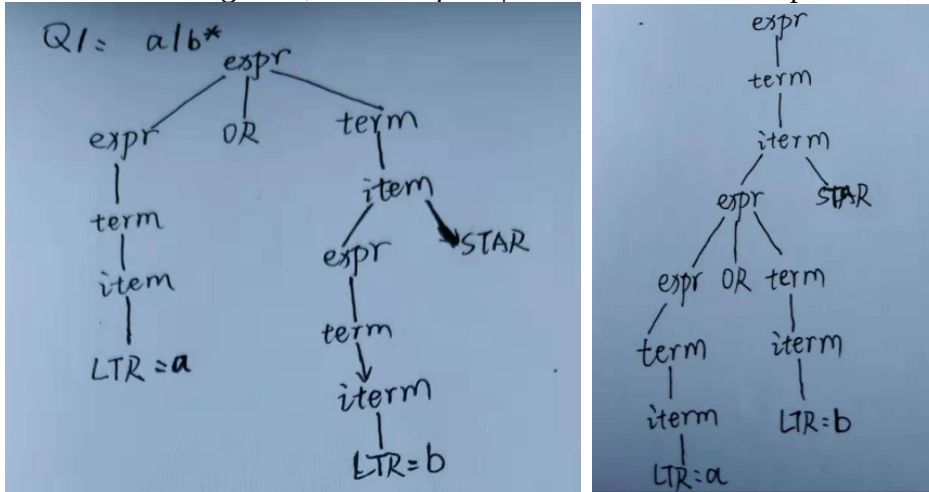
Q1:**CFG1**

```

expr → expr OR term | term
term → term item | item
item → expr STAR | expr PLUS | LTR | EPS | LPAR expr RPAR

```

The CFG is ambiguous, for example $a|b^*$ have two different parse trees.

**CFG2**

```

expr → LPAR expr RPAR | term
term → term OR factor | factor
factor → factor item | item
item → item STAR | item PLUS | LTR | EPS

```

case a : $(a|b)abc(a^*|b^+)$ is a legal regular expression, but is not in the language of the CFG.

CFG3

```

expr → expr OR term | term
term → term item | ε
item → item STAR | item PLUS | LTR | EPS | LPAR expr RPAR

```

case b : $a|$ is not a legal regular expression, but is in the language of the CFG.

CFG4

```

expr → expr OR term | term
term → term item | LPAR expr RPAR | item
item → item STAR | item PLUS | LTR | EPS

```

case a : $(a|b)^*$ is a legal regular expression, but is not in the language of the CFG.

CFG5

```

expr → LTR | EPS | term
term → term OR factor | factor
factor → factor item | item
item → item STAR | item PLUS | LPAR item RPAR | expr

```

expr
|
LTR=a

expr
|
term
|
factor
|
item
|
expr
|
LTR=a

$\text{expr} \rightarrow \text{expr OR term}$
 $\quad \quad \quad | \text{term}$
 $\text{term} \rightarrow \text{term item}$
 $\quad \quad \quad | \text{item}$
 $\text{item} \rightarrow \text{item PLUS}$
 $\quad \quad \quad \text{item STAR}$
 $\quad \quad \quad \text{LTR}$
 $\quad \quad \quad \text{EPS}$
 $\quad \quad \quad \text{LPAR expr RPAR}$

```

graph TD
    expr1[expr] --- expr2[expr]
    expr1 --- OR1[OR]
    expr1 --- term1[term]
    expr2 --- term2[term]
    term1 --- item1[item]
    item1 --- EPS[EPS]
    term2 --- term3[term]
    term2 --- item2[item]
    term3 --- term4[term]
    term3 --- item3[item]
    term4 --- item4[item]
    item4 --- PLUS1[PLUS]
    item3 --- LTRC3[LTRC3)
    item2 --- LPR[LPR]
    item2 --- expr3[expr]
    item2 --- RPR[RPR]
    item2 --- LTRCf[LTRCf)
    expr3 --- term5[term]
    term5 --- OR2[OR]
    term5 --- term6[term]
    term6 --- item5[item]
    term6 --- item6[item]
    item5 --- LTRLY[LTRLY)
    item6 --- STAR[STAR]
    OR2 --- term7[term]
    OR2 --- item7[item]
    term7 --- term8[term]
    term8 --- item8[item]
    item8 --- PLUS2[PLUS]
    item7 --- LTRC4[LTRC4)
    OR2 --- term9[term]
    OR2 --- item9[item]
    term9 --- item10[item]
    item10 --- PLUS3[PLUS]
    item9 --- LTRC5[LTRC5)
    OR2 --- term10[term]
    OR2 --- item10[item]
    term10 --- item11[item]
    item11 --- PLUS4[PLUS]
    item10 --- LTRC6[LTRC6)
  
```