Q1:
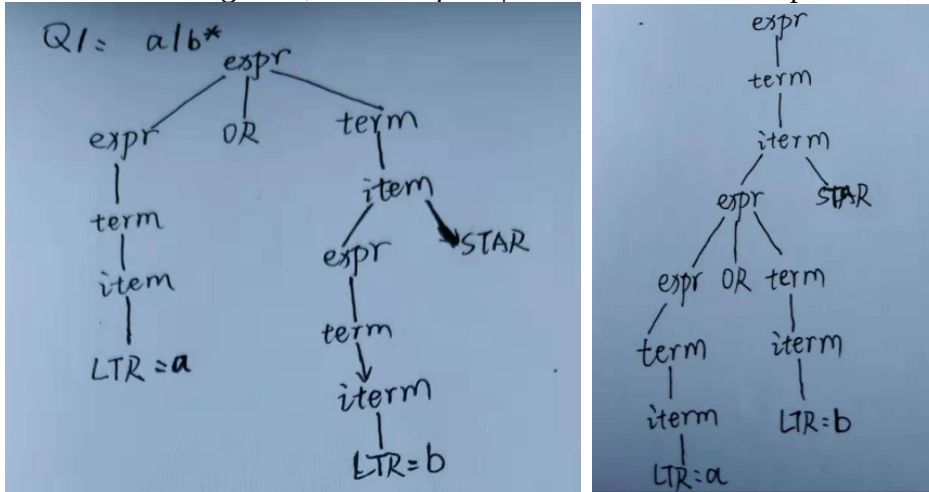
CFG1

```
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
```

The CFG is ambiguous, for example a single *LTR(a)* can have two different parse trees. Because *expr* have a loop *expr → term → factor → item → expr* , however it just can be itself *expr* , which is ambiguous.

Q2:

Q3
$x+(y*|a+d)f+|\varepsilon$