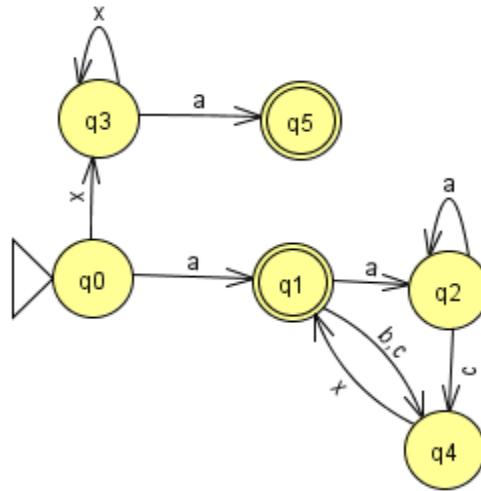


## Homework 2 - Solution

**Q1-**

Regular expression:  $a((b|a^*c)x)^* | x^*a$

DFA:



**Q2- (a)**

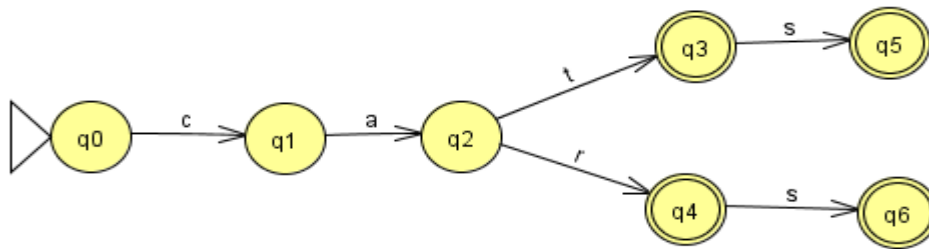
		a	b
q0	1 (init)	1,2	1
q1	1,2	1,2,3	1,3
q2	1,2,3	1,2,3,4	1,3,4
q3	1,3	1,2,4	1,4
q4	1,2,3,4	1,2,3,4,5	1,3,4,5
q5	1,3,4	1,2,4,5	1,4,5
q6	1,2,4	1,2,3,5	1,3,5
q7	1,4	1,2,5	1,5
q8	1,2,3,4,5	1,2,3,4,5,6*	1,3,4,5,6*
q9	1,3,4,5	1,2,4,5,6*	1,4,5,6*
q10	1,2,4,5	1,2,3,5,6*	1,3,5,6*
q 11	1,4,5	1,2,5,6*	1,5,6*
q 12	1,2,3,5	1,2,3,4,6*	1,3,4,6*
q13	1,3,5	1,2,4,6*	1,4,6*
q14	1,2,5	1,2,3,6*	1,3,6*
q15	1,5	1,2,6*	1,6*
q16	1,2,3,4,5,6	1,2,3,4,5,6*	1,3,4,5,6*
q17	1,3,4,5,6	1,2,4,5,6*	1,4,5,6*
q18	1,2,4,5,6	1,2,3,5,6*	1,3,5,6*
q19	1,4,5,6	1,2,5,6*	1,5,6*
q20	1,2,3,5,6	1,2,3,4,6*	1,3,4,6*
q21	1,3,5,6	1,2,4,6*	1,4,6*
q22	1,2,5,6	1,2,3,6*	1,3,6*
q23	1,5,6	1,2,6*	1,6*
q 24	1,2,3,4,6	1,2,3,4,5	1,3,4,5

q25	1,3,4,6	1,2,4,5	1,4,5
q26	1,2,4,6	1,2,3,5	1,3,5
q27	1,4,6	1,2,5	1,5
q28	1,2,3,6	1,2,3,4	1,3,4
q29	1,3,6	1,2,4	1,4
q30	1,2,6	1,2,3	1,3
q31	1,6	1,2	1

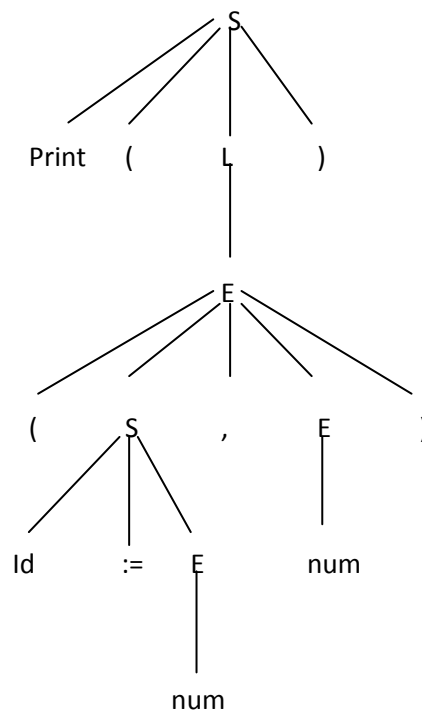
All cells containing \* represent final states.

(b)

		c	a	t	r	S
q0	1,5,10,14 (init)	2,6,11,15				
q1	2,6,11,15		3,7,12,16			
q2	3,7,12,16			4,8 (f)	13,17 (f)	
q3	4,8					9 (f)
q4	13,17					18 (f)
q5	9					
q6	18					



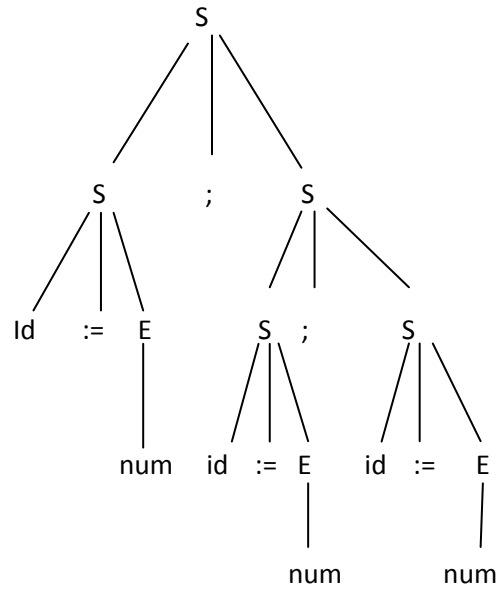
Q3:



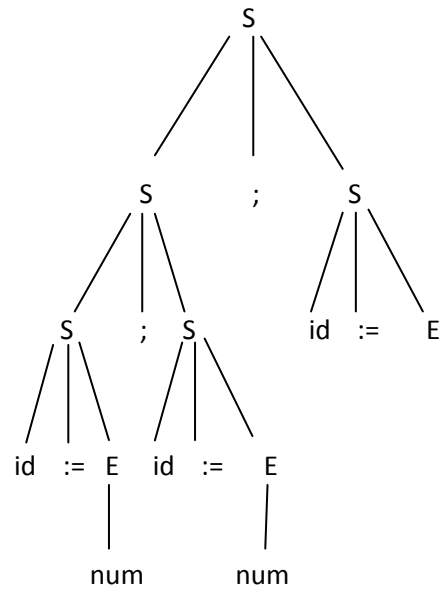
**Q4:** Yes, the grammar will still be ambiguous. Because the first rule 'S->S ; S' can result in two parse trees for same derivation. For examples, the following program has two parse trees:

id:=num ; id:=num ; id:=num

Parse Tree 1:



Parse Tree 2:



Q5:

Program  $\rightarrow$  MainClass Decl  
Decl  $\rightarrow$  ClassDecl Decl | ClassDecl |  $\epsilon$

Q6:

- (a)  $S \rightarrow a S a \mid b S b \mid \text{epsilon}$
- (b)  $S \rightarrow a A B$   
 $A \rightarrow a A \mid \text{epsilon}$   
 $B \rightarrow a B b \mid \text{epsilon}$
- (c)  $S \rightarrow A S \mid \epsilon$   
 $A \rightarrow ( S ) \mid [ S ]$