QUESTIONS ON SYNTAX ANALYSIS

a) Consider the following context-free grammar:

Goal → L
L → E ; L
L → E
E → E + T
E → T
T → id
T → id ( )
T → id (L)

The terminal symbols of this grammar are ; + ( ) id

(i) Derive a leftmost derivation for the string x + y ; z (y ( )) and show the corresponding parse tree. (5 marks)

(ii) Transform this grammar so that it can be used to construct a top-down predictive parser with one symbol of lookahead. (6 marks)

b) Consider the grammar and the Action and Goto tables below.

1. G → L
2. L → L P
3. L → P
4. P → (P)
5. P → ( )

STATE	ACTION			GOTO	
	(	)	eof	L	P
0	S3			1	2
1	S3		accept		4
2	R3		R3		
3	S6	S7			5
4	R2		R2		
5		S8			
6	S6	S10			9
7	R5		R5		
8	R4		R4		
9		S11			
10		R5			
11		R4			

Show, in full detail, the steps that an LR(1) parser would follow to parse the string (( )) ( ) using the above grammar. For each step, your answer should show the contents of the stack, what the next input is and the action that is taken. (5 marks)

c) Consider the following grammar:

1. A → bA
2. A → XY
3. A → ε
4. X → aS
5. X → bS
6. X → ε
7. Y → cS
8. Y → ε

Does it have the LL(1) property? (4 marks)

d) Show that the following context-free grammar is ambiguous:

S → aSbS | bSaS | ε

(4 marks)