1. Consider the following grammar G:

$S' \rightarrow S$
$S \rightarrow \mathbf{0}\,S\,\mathbf{1}$
$S \rightarrow \mathbf{1}\,S\,\mathbf{0}$
$S \rightarrow \mathbf{c}$

where S is a nonterminal and **a**, **b**, and **c** are terminals.
(a) [5] What is the language L(G)
(b) [10] Construct the collection of the sets of LR(0) items
(c) [10] Construct the SLR parsing table of *G*. Please specify clearly how every shift or reduce action is determined

2. Consider the following grammar G:

$S \rightarrow \mathbf{ab}S \mid \mathbf{ac}S \mid \mathbf{c}$

where S is a nonterminals and **a**, **b**, and **c** are terminals.
(a) [5] Is G LL(1)? Explain why it is not ***WITHOUT*** giving a parsing table.
(b) [10] Modify the grammar G to G' to make G' LL(1)
(c) [10] Build LL(1) parsing table.

3. Consider the following grammar G:

$S' \rightarrow S$
$S \rightarrow A\mathbf{a} \mid \mathbf{b}A\mathbf{c} \mid \mathbf{dc} \mid \mathbf{bda}$
$A \rightarrow \mathbf{d}$

where S and A are nonterminals and **a**, **b**, **c**, and **d** are terminals.
(a) [10] Is G LR(1)? If yes, give the parsing table. Otherwise, explain why.
(b) [10] Is G LALR(1)? If yes, give the parsing table. Otherwise, explain why.

4. Consider the following grammar G:

$S' \rightarrow S$
$S \rightarrow \mathbf{i}E\mathbf{t}S \mid \mathbf{i}E\mathbf{t}S\mathbf{e}S \mid \mathbf{a}$
$E \rightarrow \mathbf{b}$

where S and E are nonterminals and **i**, **t**, **e**, **a**, and **b** are terminals
(a) [5] Please identify the conflicts in G
(b) [5] Build the parse tree of the word **i***E***ti***E***t***S***e***S** if shift action is chosen
(c) [5] Build the parse tree of the word **i***E***ti***E***t***S***e***S** if reduce action is chosen

5. [10] Consider the grammar G

$S' \rightarrow S$
$S \rightarrow (\,S\,)\,S \mid \epsilon$

An NFA N can be formed if each LR(0) item is treated as a state:

- There is a transition from $A \rightarrow \alpha \cdot X\,\beta$ to $A \rightarrow \alpha X \cdot \beta$ label X, and
- There is a transition from $A \rightarrow \alpha \cdot B\,\beta$ to $B \rightarrow \cdot\gamma$ labeled ϵ

Please find an equivalent DFA D