

1

The following grammar is not suitable for a top-down predictive parser. Identify the problem and correct it by rewriting the grammar. Show that your new grammar satisfies the  $ll(1)$  condition.

$L$

2

Consider the following grammar:

- (a) Does this grammar has left recursions? If you believe so, try to rewrite the grammar to remove left recursions; the new grammar should describe the same set of expressions as the original grammar does.
- (b) Is the original grammar a LL(1) grammar? Justify your answer.

3

Write a grammar to describe all binary numbers that are multiples of four. Note: 0 is a multiple of 4. The binary number is unsigned (i.e., it contains no sign bit). It should not contain leading 0s. For instance 00100 is not legal, but 100 is.