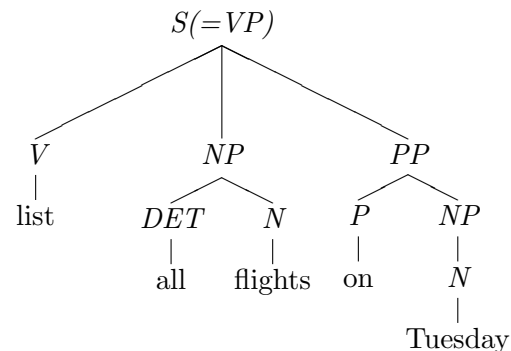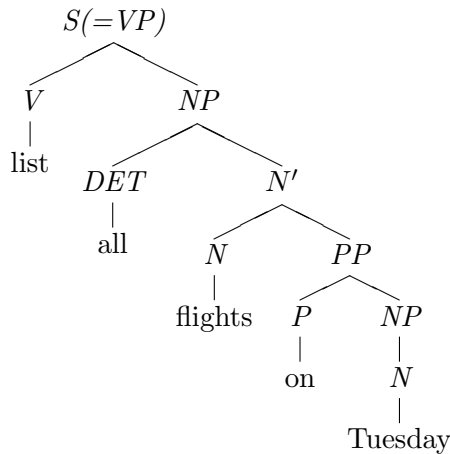## CS/ENGRI 172, Fall 2002
11/1/02: Lecture Twenty-Seven Handout

Topics: Context-free grammars (CFGs).

**Some example sentence structures**

Definitions of CFGs and related concepts

A *context-free grammar* (CFG) consists of four parts:

- the *terminals*: a finite set of at least one basic symbol;

- the *non-terminals* (sometimes called *variables*): a finite set of at least one symbol (no symbol can be both a terminal and a non-terminal);

- the (single) designated start non-terminal; and

- the *rewrite rules*: a finite set of at least one rule describing how a single non-terminal can be rewritten as a sequence of terminals and/or nonterminals (possibly intermixed).

Sentences — sequences of terminal symbols — are generated by rewriting the start non-terminal until no non-terminals are left.

We can represent the rewriting process by *parse trees*. In a parse tree, the interior nodes are labelled by non-terminals (with the root labelled with the start non-terminal), the leaves are labelled by terminals, and the children of an internal node represent, in order, the result of rewriting the non-terminal labelling the node according to one of the rewrite rules in the grammar. That is, if we have the following parse tree:
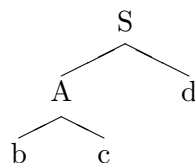
then the CFG generating the parse tree must contain the rewrite rules $A \to bc$ and $S \to Ad$.