Homework IV

1. [25 points]
Let {0, 1} be the alphabet of terminal symbols. Construct an attribute grammar that has the following properties,, and justify its correctness:

(i) all the strings $\{0^k 1x \mid k \geq 0$ and x is a binary expansion of k$\}$ (plus others if you wish) may be derived with the production rules, and

(ii) attributes include the Boolean attribute 'valid' (plus others if you choose) that is true at the root node of all the derivation trees of the language given in (i), and false at the root nodes of derivation trees of all other strings.

2. [25 points]
Consider the alphabet of terminals {0, 1}, and the language $L = \{(0^n 1^n)^n \mid n \geq 1\}$. For this problem devise an attribute grammar that derives all the strings in L, and others if you wish. There is to be a Boolean valued attribute 'valid' for the start symbol, so that 'valid' is true at the root node of a derivation tree just when the derived string is in L, and false otherwise. Justify the correctness fo your solution.

For each of these problems, the justification of the correctness of your solution should include:

- a clear indication of the collection of *all* strings derived by your context-free productions, and the structure of their derivation trees,
- informal description of the role of each attribute that you use, their interdependencies, and whether each is inherited or synthesized, and
- analysis showing that the proper Boolean value is obtained for the root node of each tree.