1998 Paper 3 Question 1

Compiler Construction

Give *short* answers for each of the following.

(a) Give a program which has a different result when interpreted using dynamic scoping from that using static scoping.

(b) Give a program (using `let` to declare variables) which runs with no run-time type errors under dynamic typing but is invalid in a static typing regime such as that of Java or C.

(c) Compared with `int v[8]`, why might the declaration `int v[e]` cause less efficient code to be compiled if e is not a constant expression, or even if e is a large constant?

(d) Give two context-free grammars which accept the same strings with one being ambiguous and one non-ambiguous.

(e) Give a data-structure type declaration in a language of your choice which might be useful to represent parse trees for the following grammar:

```
E  ->  E + T | E - T | T
T  ->  P ^ T | P
P  ->  ( E ) | n
```

Here `E` is the start symbol and `n` is a terminal symbol representing the result of lexing an integer constant.

[4 marks each]

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