

1996 Paper 1 Question 2

Foundations of Computer Science

The ML data type `BOOL`, defined below, is to be used to represent boolean expressions.

```
datatype BOOL = VAR of string
              | NOT of BOOL
              | AND of BOOL*BOOL
              | OR  of BOOL*BOOL;
```

The constructor `VAR` is used to represent named boolean variables, and `NOT`, `AND` and `OR` are used to represent the corresponding boolean operators.

Define a function that will return a list of the distinct names used in a given boolean expression. [4 marks]

A context is represented by a list of strings corresponding to the boolean variables that are set to true. All other variables are deemed to be set to false. Define a function that will evaluate a given boolean expression in a given context. [3 marks]

Incorporate your two functions into a program that will determine whether a given boolean expression is true for all possible settings of its variables. [3 marks]