

2002 Paper 1 Question 1

Foundations of Computer Science

Consider the following ML declarations, involving binary trees:

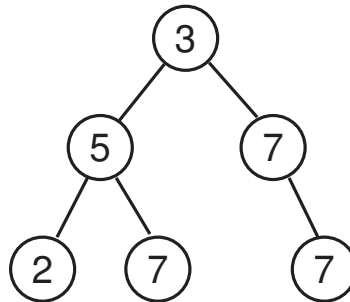
```
datatype 'a tree = Lf
                | Br of 'a * 'a tree * 'a tree;

exception E;

fun path Lf = raise E
  | path (Br(v,t1,t2)) = if v=7 then []
                        else 1 :: path t1
                        handle E => 2 :: path t2;
```

- (a) The function `path` returns a path (a list of 1s and 2s) to an occurrence of the number 7 in the tree. Carefully explain how `path` works, taking the tree shown below as an example and indicating which occurrence of 7 will be found.

[5 marks]



- (b) Code the function `paths`, which returns the list of all paths to 7s in a binary tree.

[5 marks]