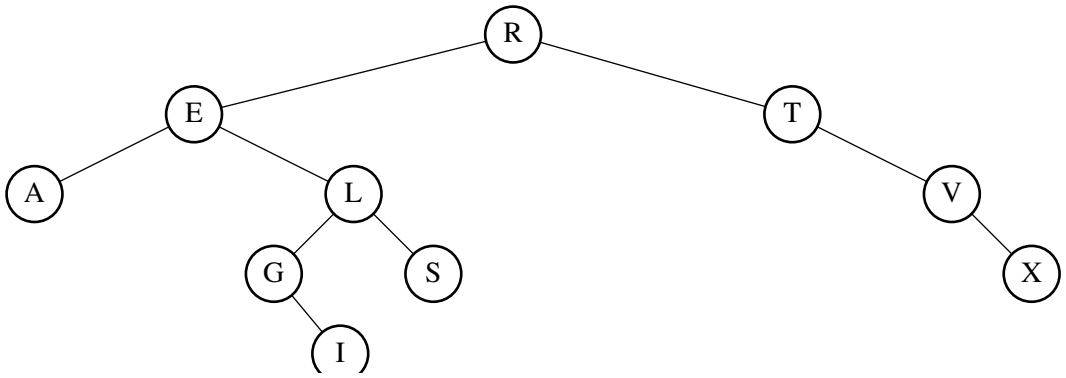
2006 Paper 10 Question 3

Data Structures and Algorithms

(*a*) Briefly explain what a binary search tree (BST) is, listing its properties. Is the following binary tree a BST or not, and why?



[3 marks]

(*b*) Describe an optimally efficient algorithm to find the predecessor of a given node n in a BST and explain why it works. [6 marks]

(*c*) Describe an optimally efficient algorithm for deleting a node d from a BST when neither of d's subtrees is empty. Explain why it works and prove that what remains is still a BST. [5 marks]

(*d*) Assume that node l, whose key is k_l, is a leaf of a BST and that its parent is node p, with key k_p. Prove that, of all the keys in the BST, k_p is either the smallest key greater than k_l or the largest key smaller than k_l. [6 marks]