I. Consider \( n \) processors arranged as a complete binary tree. (Note that the depth of the tree is \( \log_2 n \) and each node contains one processor.) The path between two leaves is the unique simple path that goes through the root. \( n \) files are stored independently and u.a.r. into the \( n \) processors. For a suitably large constant \( c \), prove that with high probability, for every pair of leaves \( u \) and \( v \), the number of files in the processors on the path from \( u \) to \( v \) is \( \leq c \log_2 n \). Don't get bogged down with the difference between base 2 and base \( e \) of the logarithm.

II. Random variables \( A, B, C, D \) are +1, −1 valued. They are uniformly distributed and independent. Given that

\[
\Pr(A + B + C + D \leq 2) + \Pr(A + B + C + D \geq 0) < 1,
\]

and \( A \) has already been chosen as +1, fix a value of \( B \) by the conditional probability method of derandomization.