Mini-max Algorithm (module-3)

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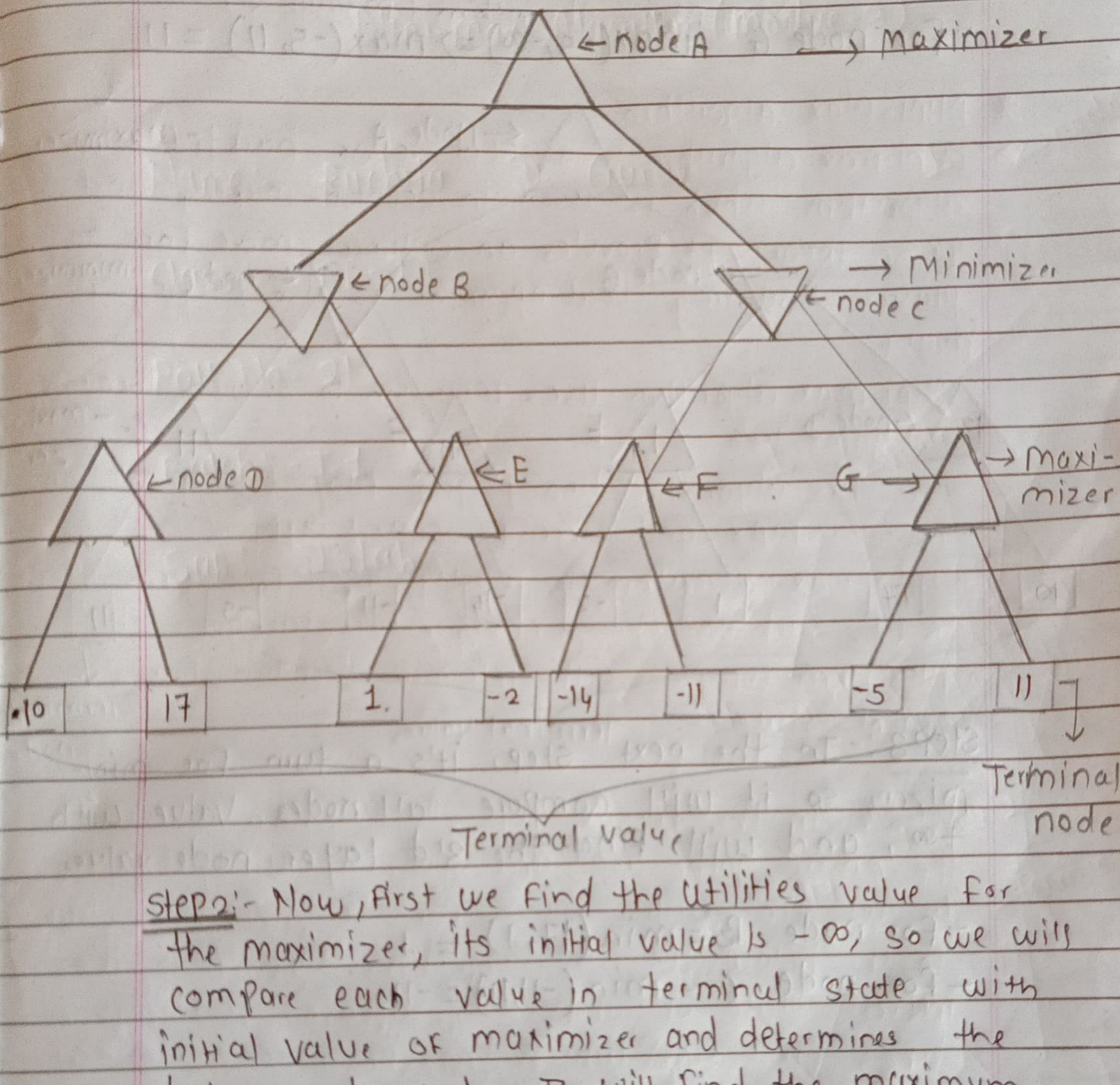
Mini-Max Algorithm (module 3)

* Mini-Max algorithm

→ - Mini-max algorithm is a recursive or backtracking algorithm which is used in decision-making and game theory. It provides an optimal move for the player assuming that opponent is also playing optimally

- Mini-max algorithm uses recursion to search through the game-tree
- In this algorithm two players play the game, one is call MAX and other is called MIN.
- Min-Max algorithm is mostly used for game playing in AI. such as chess, checkers, tic-tac-toe. This Algorithm computes the minimax decision for the current state.

Step 1: In the first step, the algorithm generates the entire game-tree and apply the utility function to get the utility values for the terminal states. In the below tree diagram, let's take A is the initial state of the tree. Suppose maximizer takes first turn which has worst-case initial value = - infinity, and minimizer will take next turn which has worst-case initial value = + infinity



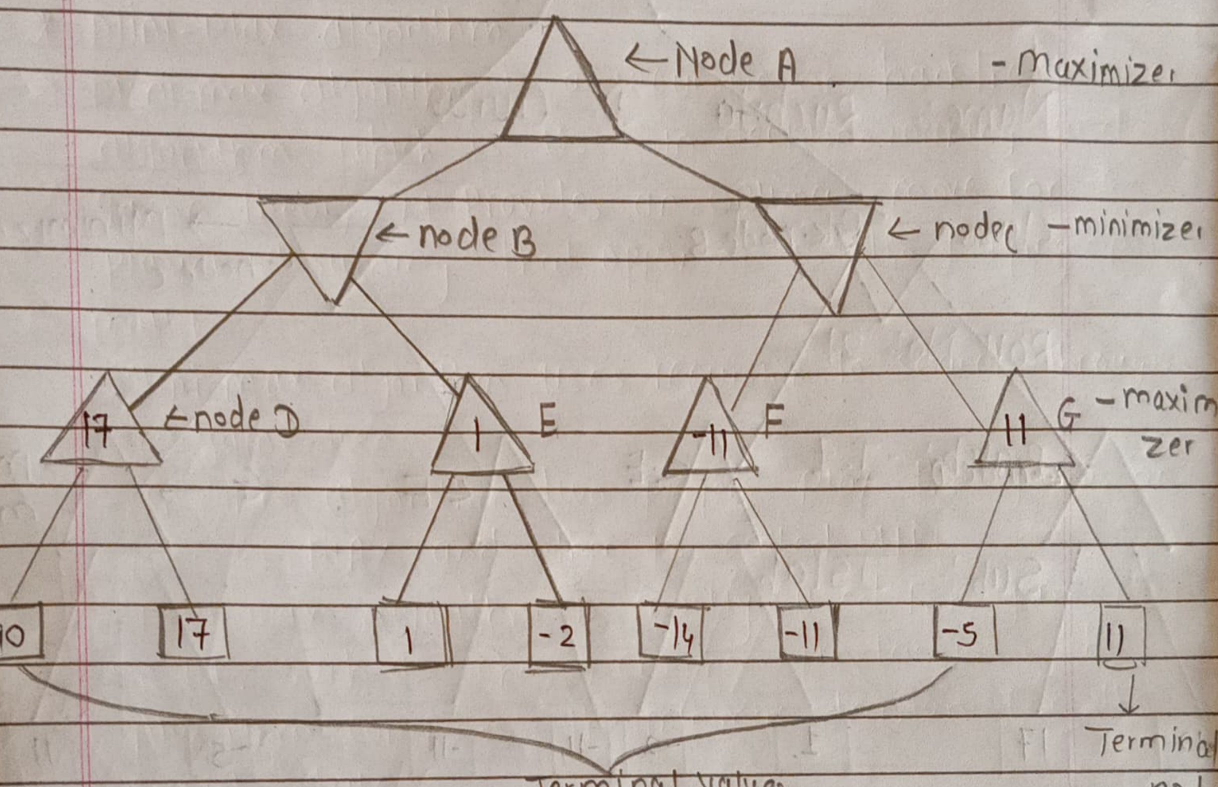
Step 2:- Now, first we find the utilities value for the maximizer, its initial value is $-\infty$, so we will compare each value in terminal state with initial value of maximizer and determines the higher nodes values. It will find the maximum among the all.

- For node D $\quad max(10, -\infty) \Rightarrow max(10, 17) = 17$

- For node E $\quad max(1, -\infty) \Rightarrow max(1, -2) = 1$

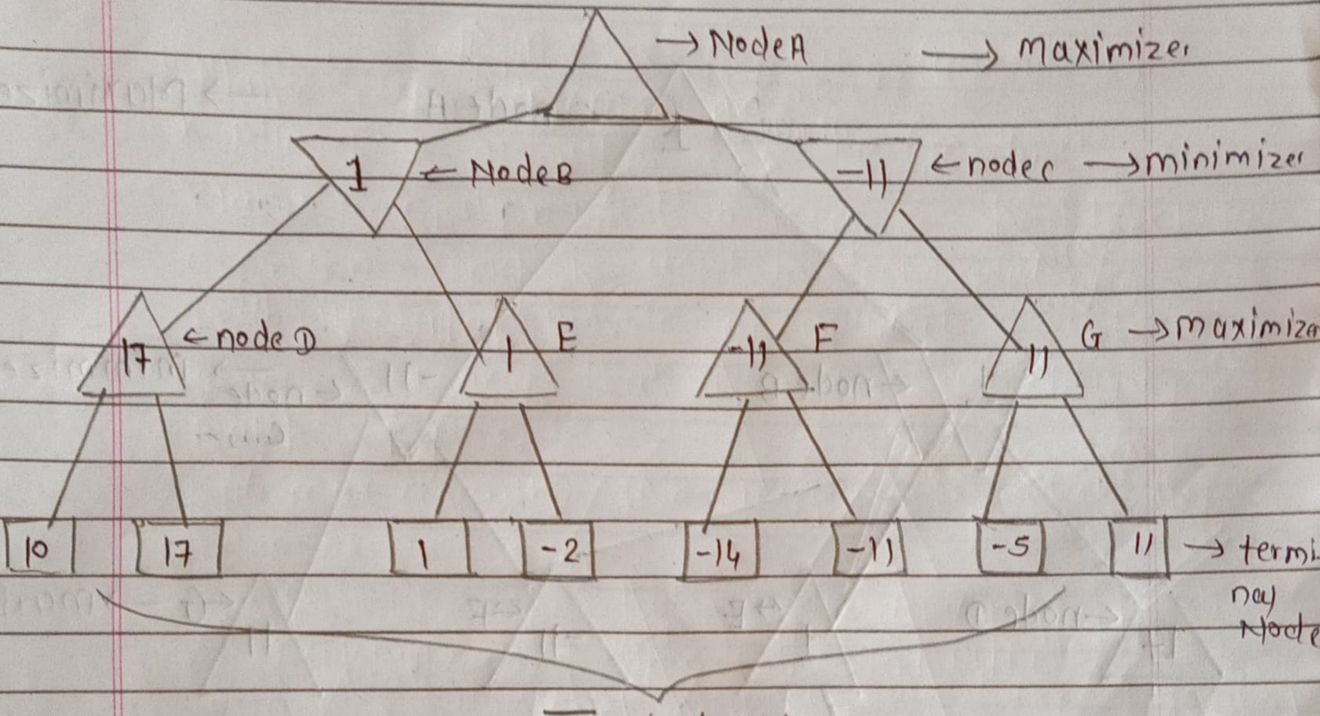
- For node F $\quad max(-14, -\infty) \Rightarrow max(-14, -11) = -11$

- For node G $\max(-5,-\infty) \Rightarrow \max(-5, 11) = 11$



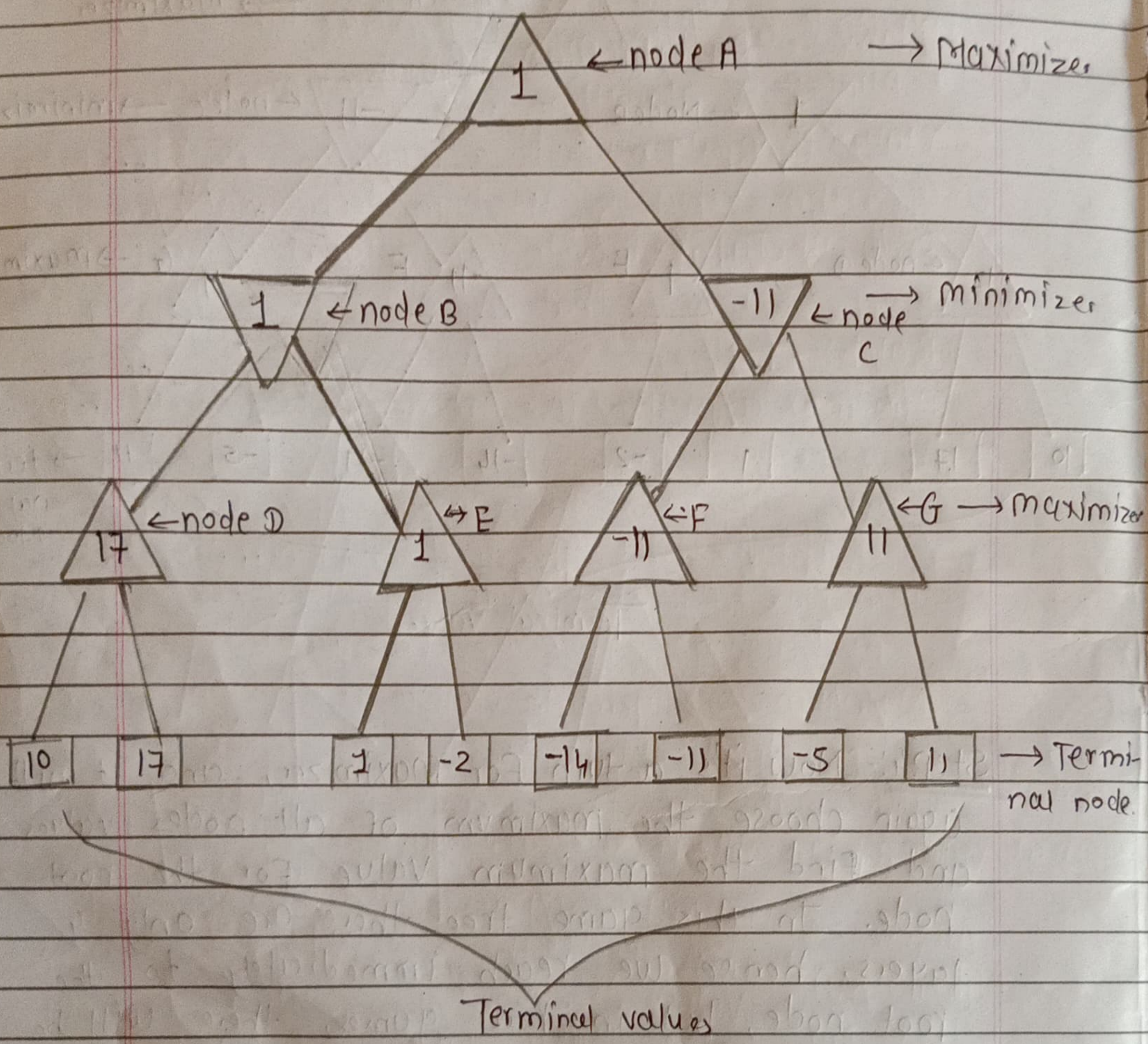
Step 8 :- In the next step, it's a turn for minimizer, so it will compare all nodes value with $+\infty$, and will find the 3rd layer node value

- For node $B = \min(17, 1) = 1$
- For node $C = \min(-11, 11) = -11$



Step4:- Now it's a turn for maximizer, and it will again choose the maximum of all nodes values and find the maximum value for the root node. In this game tree, there are only 4 layers, hence we reach immediately to the root node, but in real games, there will be more than 4 layers.

- For node A max(1, -11) = 1



That was the complete workflow of the minimax algorithm with two player game.