K.G.C.E.
Karjat - Raigad

Name : Aishwarya Y. charan

Roll No : 11

Class : BE1IT
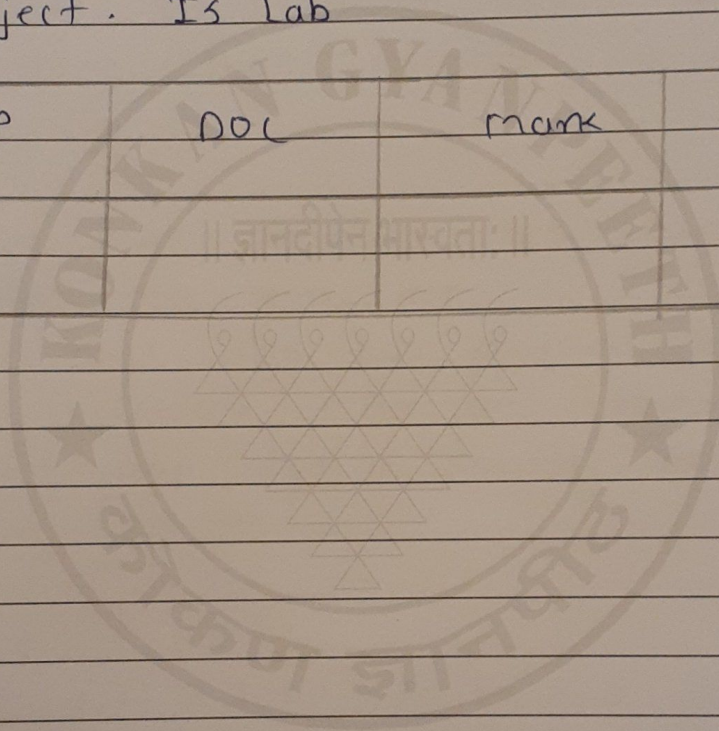
Subject : IS Lab

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Min - Max Algorithm :
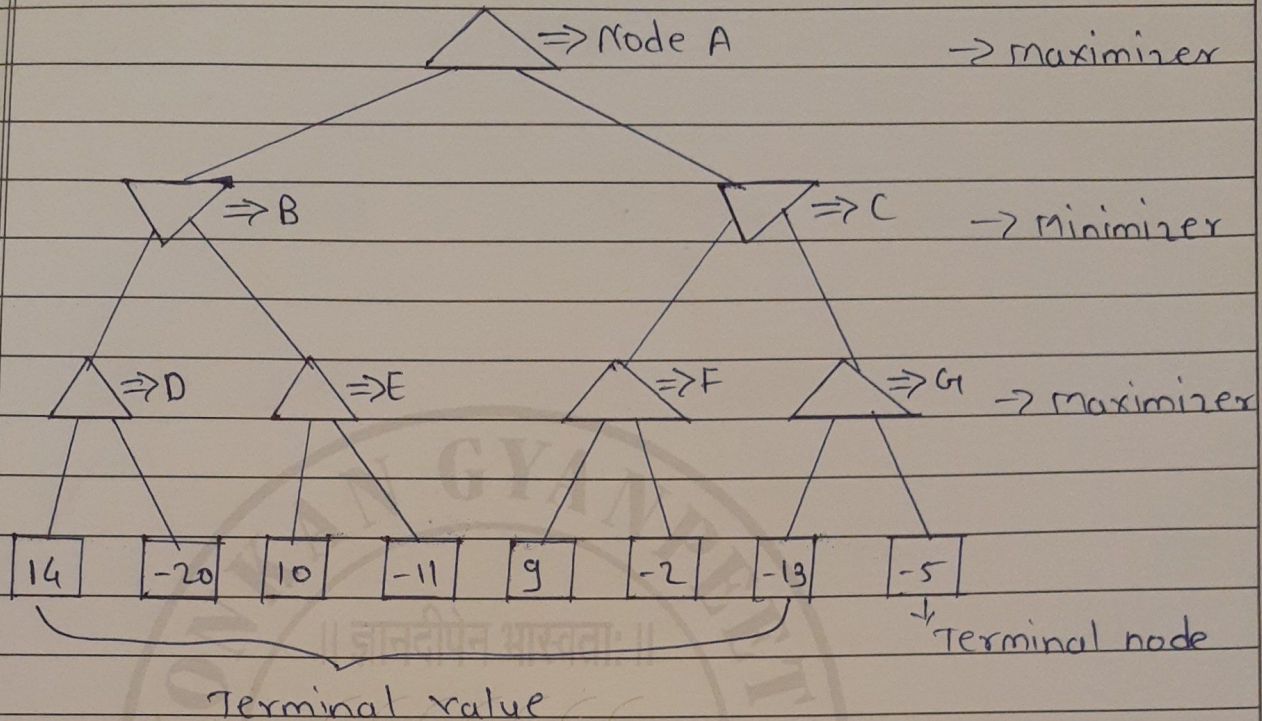
Min max algorithm :

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

- Min max algorithm uses recursion to search through the game-tree.
- In this algo two players play the game, one is called MAX and other is called MIN.
- min-max algo is mostly used for game playing in AI.

- Step 1 :
lets take A is the initial state of the tree. Suppose maximizer takes first turn (when or) which has worst-case initial value = - infinity , and minimizer will take next turn which has worst - case initial value = + infinity.

⟹ Node A → maximizer

⟹ B → minimizer

⟹ C

⟹ D ⟹ E ⟹ F ⟹ G → maximizer

| 14 | -20 | 10 | -11 | 9 | -2 | -13 | -5 |

Terminal node

Terminal value

— Step 2 :

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 all.
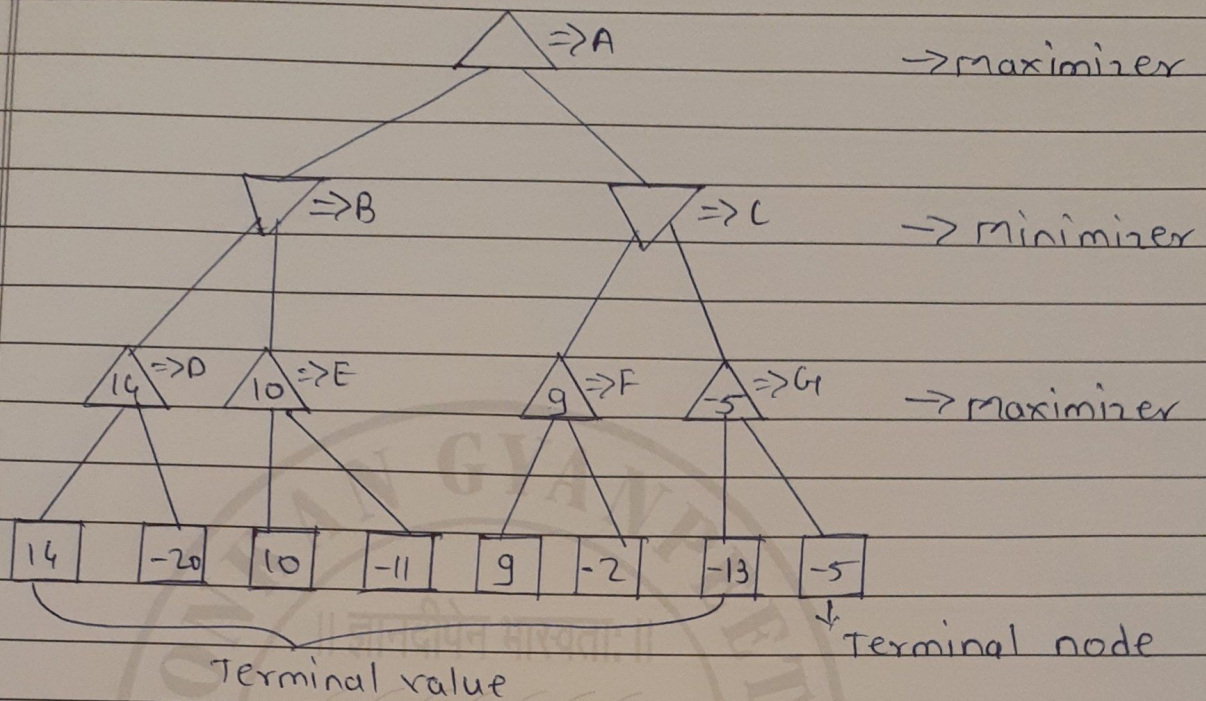
for node D : max $(14, -\infty)$ ⟹ max $(14, -20) = 14$

For node E : max $(10, -\infty)$ ⟹ max $(10, -11) = 10$

For node F : max $(9, -\infty)$ ⟹ max $(9, -2) = 9$

For node G : max $(-13, -\infty)$ ⟹ max $(-13, -5) = -5$

=>A   ->maximizer

=>B   => C   -> minimizer

14 =>D   10 =>E   9 =>F   -5 =>G   -> maximizer

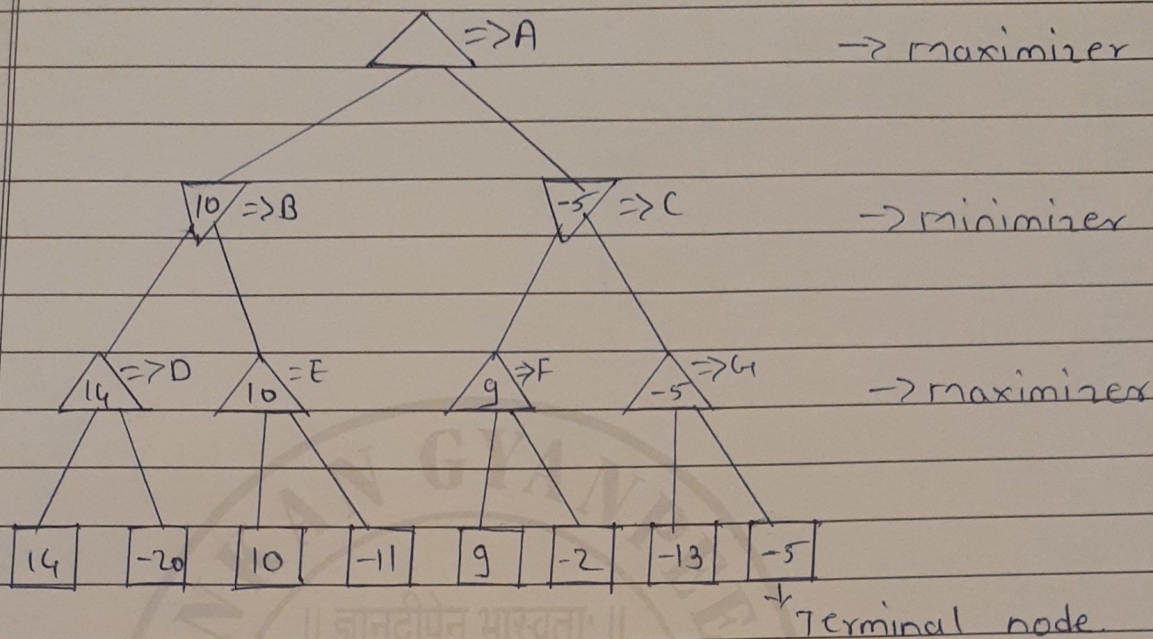| 14 | -20 | 10 | -11 | 9 | -2 | -13 | -5 |

Terminal value

Terminal node

- step 3 :-

In the next step, it is a turn for minimize, so it will compare all nodes value with two, and will final the 3rd layer node value.

for node B : min (14,10) = 10

for node C : min (9,-5) = -5

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              =>A                    -> maximizer

    10 =>B          -5 =>C           -> minimizer

  14 =>D   =E    9 =>F    -5 =>G     -> maximizer
     10

14 | -20 | 10 | -11 | 9 | -2 | -13 | -5
                                      Terminal node.
```
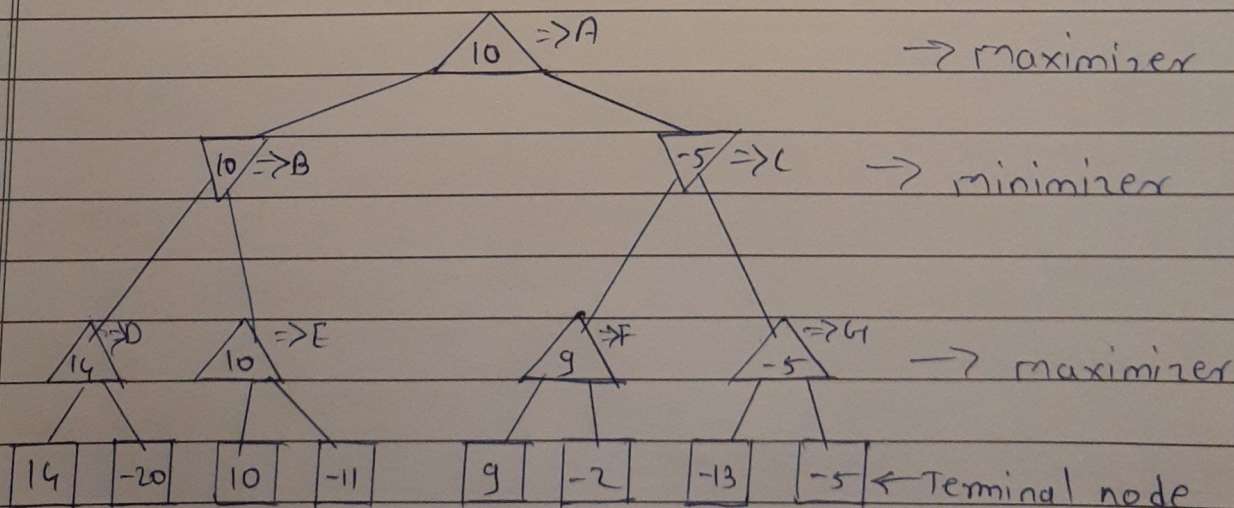
— step 4 :

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.

for node A : max (10, -5) = 10


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              10 =>A                 -> maximizer

    10 =>B            -5 =>C         -> minimizer

  14=>D   10 =>E   9 =>F   -5 =>G    -> maximizer

14 | -20 | 10 | -11 | 9 | -2 | -13 | -5 <- Terminal node
```

Hence, it was the complete workflow of minmax algorithm with two player game.