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CLASS :- BETT

ROLL NO:- 32

SUBJECT :- ISLAB

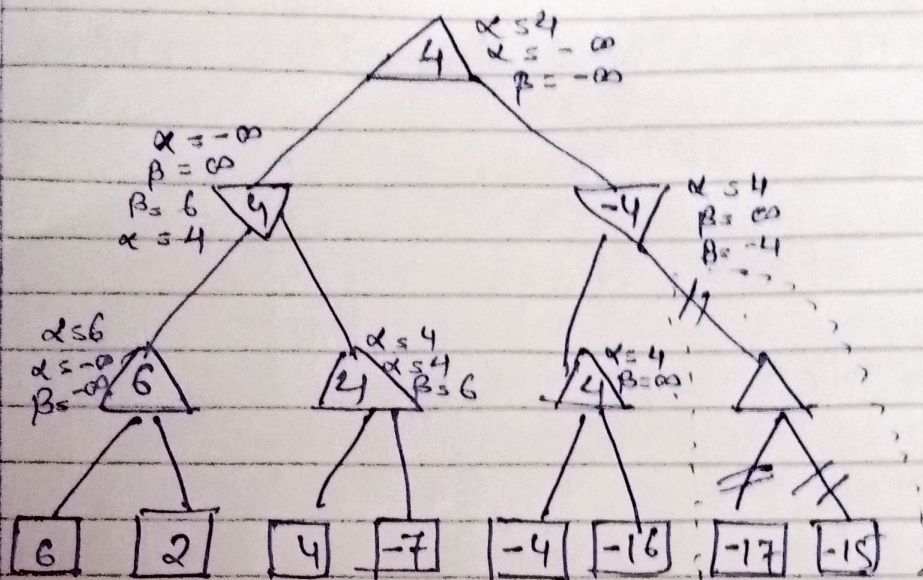| Date of performance	Date of submission	Marks	Signature

Alpha - Beta Pruning :-

Alpha-beta pruning = Alpha beta pruning is a modified version of the min max algorithm. It is an optimization technique for the minmax algorithm.

- Alpha (α) = The best (high-value)
  = Initial value of alpha is $-\infty$.

- Beta (β) = The best (highest value)
  = Initial value is Beta is $+\infty$.

- Rules & conditions :

1) The maximum player will only update the value of alpha.

2) The minimum player will only update the value of B.

3) We will only pass the alpha, beta values to the child nodes.

4) Node values will be passed to upper node instead of values of alpha & beta.

- Condition to prune : $a > b$ or $b \leq a$.

- When alpha is greater than or equal to beta.

The diagram shows a minimax game tree with alpha-beta pruning. The root (max) node is labeled **4** with $\alpha \leq 4$, $\alpha \leq -\infty$, $\beta = -\infty$.

Left child (min) node **4** with $\alpha = -\infty$, $\beta = \infty$, $\beta = 6$, $\alpha \leq 4$.

Right child (min) node **-4** with $\alpha \leq 4$, $\beta = \infty$, $\beta = -4$.

Leaf level max nodes: **6** ($\alpha \leq 6$, $\alpha \leq -\infty$, $\beta \leq \infty$), **4** ($\alpha \leq 4$, $\alpha \leq 4$, $\beta \leq 6$), **4** ($\alpha \leq 4$, $\beta = \infty$), and a pruned right node.

Leaf values: 6, 2, 4, -7, -4, -16, -17, -15

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1) $\alpha(-\infty, 6) = 6$

   $\alpha(-\infty, 2) = 2$ — Max (Bottom left)

   $\alpha(6, 2) = 6$

2) $\beta(\infty, 6) = 6$ — Min (left)

3) $\alpha(-\infty, 4) = 4$ — Max (Bottom left)

   $\alpha(-\infty, -7) = -7$ (left node)

   $\alpha(-\infty, 4, 7) = 4$

4) $\alpha(4, -4)$ — Top (max)

5) $\beta(6, 4) \leq 4$ — Min (right)

6) $\alpha(4, -4) \leq 4$

   $\alpha(4, -16) \leq 4$

   $\alpha(-4, -16) = -4$

7) $\beta(\infty, -16) = -16$ — Min (right)

   $\alpha = 4$

   $\beta = -4$

   $\alpha \gg \beta$ ∴ The next node is pruned.

α a) $-x_1 = 4$ Max

        $\beta = \infty$

     α $(4, -4)$ $r = 4$ Solution

8

2

α: 6
β: =

6

α: -∞
β: 4

4

-7

α: 4
β: 6

4

α: 4
β: 4

4

α: 4
β: =

4

-15

4

α: 4
β: 4

4

-17

-15

Start Animation

Depth   -   +

Branching Factor   -   +

Swap Min/Max   Regenerate Tree

Reset Tree   Show Solution

Check Answer   **Check**