1. Solution:

Minimax Algorithm: the evaluation function is a vector of values, one for each player, and the backup step selects whichever vector has the highest values for the value whose turn it is to move.

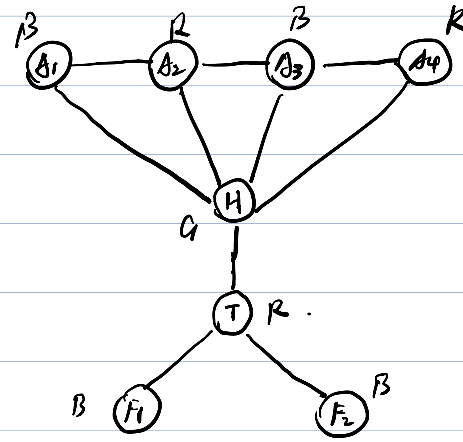
Alpha-Beta Algorithm: α is the lower bound for MIN and β is the upper bound for MAX. Any branches of MIN that contradict α or any branches of MAX that contradict β will be pruned.

It is possible to prune any node, because of competitive relationship between two players and the assumption that each player will hit his or her best performance.

When the given constraint is added, it is impossible to prune any nodes, because an unexamined leaf node might be optimal for both players.

2. Solution:

Graph Construction:



domain {B, G, R}

$A_1 = B \rightarrow H = B$, conflict with $A_1 \rightarrow H = G \rightarrow A_4 = B$
$\rightarrow F_1 = B \rightarrow A_2 = B$, conflict with $A_1 \rightarrow A_2 = G$, conflict with H
$\rightarrow A_2 = R \rightarrow F_2 = B \rightarrow \cdots$
$\cdots \rightarrow A_3 = B$ conflict with $A_4 \rightarrow A_3 = G$, conflict with H
$\rightarrow A_3 = R$, conflict with $A_2 \rightarrow$ Conflict set is $\{A_2, H, A_4\}$
$\rightarrow$ Add $\{H, A_4\}$ to A_2's conflict set $\rightarrow A_2$ has no more values
$\rightarrow$ Backtrack $\rightarrow$ Conflict set is $\{A_1, H, A_4\} \rightarrow$ jump to A_4
$\rightarrow A_4 = G$, conflict with $H \rightarrow A_4 = R \rightarrow F_1 = B \rightarrow \cdots$
$\rightarrow A_2 = B$, conflict with $A_1 \rightarrow A_2 = G$, conflict with G
$\rightarrow A_2 = R \rightarrow F_2 = B \rightarrow A_3 = B \rightarrow T = B$, conflict with $F_1 \rightarrow$
$T = G$, conflict with $H \rightarrow T = R$

3. Solution:

(a)

A	B	D	$\neg A \vee \neg B \vee D$
TRUE	TRUE	TRUE	TRUE
TRUE	TRUE	FALSE	FALSE
TRUE	FALSE	FALSE	TRUE
TRUE	FALSE	TRUE	TRUE
FALSE	TRUE	TRUE	TRUE
FALSE	TRUE	FALSE	TRUE
FALSE	FALSE	TRUE	TRUE
FALSE	FALSE	FALSE	TRUE.

Later we use T to represent TRUE, F to represent FALSE.

(b)

A	B	C	D	$(A \land C) \lor (B \land D)$
T	T	T	T	T
T	T	T	F	T
T	T	F	T	T
T	T	F	F	T
T	F	T	T	T
T	F	T	F	F
T	F	F	T	F
T	F	F	F	F
F	T	T	T	T
F	T	T	F	F
F	T	F	T	F
F	T	F	F	F
F	F	T	T	T
F	F	T	F	F
F	F	F	T	F
F	F	F	F	F

(c)

A	B	C	$(A \Rightarrow B) \land A \land C$
T	T	T	T
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	F
F	F	F	F

(d)

A	B	C	D	$(A \Rightarrow B) \wedge (C \Rightarrow D)$
T	T	T	T	T
T	T	T	F	F
T	T	F	T	T
T	T	F	F	T
T	F	T	T	F
T	F	T	F	F
T	F	F	T	F
T	F	F	F	F
F	T	T	T	T
F	T	T	F	F
F	T	F	T	T
F	T	F	F	T
F	F	T	T	T
F	F	T	F	F
F	F	F	T	T
F	F	F	F	T

4. Solution:

(a): (i) FALSE

$(R \land E) \iff C$ states that all conservatives are radical and electable

(ii) TRUE

$R \Rightarrow (E \iff C)$ states that if a person is a radical, then he or she is electable if and only if they are electric.

(iii) FALSE.

$R \Rightarrow ((C \Rightarrow E) \lor \neg E) \equiv \neg R \lor \neg C \lor E \lor \neg E$, which is always TRUE for any assignment.

(b):

(i) Yes. $(R \land E) \iff C \equiv ((R \land E) \Rightarrow C) \land (C \Rightarrow (R \land E))$

$\equiv [(R \land E) \Rightarrow C] \land [\neg C \lor (R \land E)]$

$= [(R \land E) \Rightarrow C] \land (\neg C \lor R) \land (\neg C \lor E)$

$= [\neg R \lor \neg E \lor C] \land (\neg C \lor R) \land (\neg C \lor E)$

(ii) Yes. $R \Rightarrow (E \iff C) \equiv \neg R \lor [(E \Rightarrow C) \land (C \Rightarrow E)]$

$\equiv \neg R \lor [(\neg E \lor C) \land (\neg C \lor E)]$

$\equiv (\neg R \lor \neg E \lor C) \land (\neg R \lor \neg C \lor E)$

(iii) Yes. $R \Rightarrow ((C \Rightarrow E) \lor \neg E) \equiv \neg R \lor (\neg C \lor E \lor \neg E)$

True $\Rightarrow$ True.