Asignment-2 (Ritika Goyal) (301401516)

QUES1:

a) False.
Justification: lets take example of vacuum cleaner who does not have knowledge that which tile is dirty or clean so it has partial information about environment but when it reaches any tile, then it can sense dirt by local dirt sensor and simply suck it which is right decision to attain performance measure and thus is rational.

b) True.
Justification: An agent playing chess needs to keep track of previous moves as every next moves of a player is based on the opponent's previous so it is not a reflex agent, and it can be rational agent as well.

c) True.
Justification: If for every action done by agent has the same output and thus it does not matter which action it chooses to do. Due to same output, the agent will just have one state and will be rational.

d) False.
Justification: When the program for the mathematical functions like calculating the square root or squaring an integer was written, the result may overflow (due to exceeding number of bits). It means there exist some cases in which agent program will fail due to running out of memory. So, every agent cannot be implemented by some program/machine combination.

e) True.
Justification: Consider a deterministic task environment in which each action of the agent has the same result, when the action is selected at random, it does not matter as it is rational.

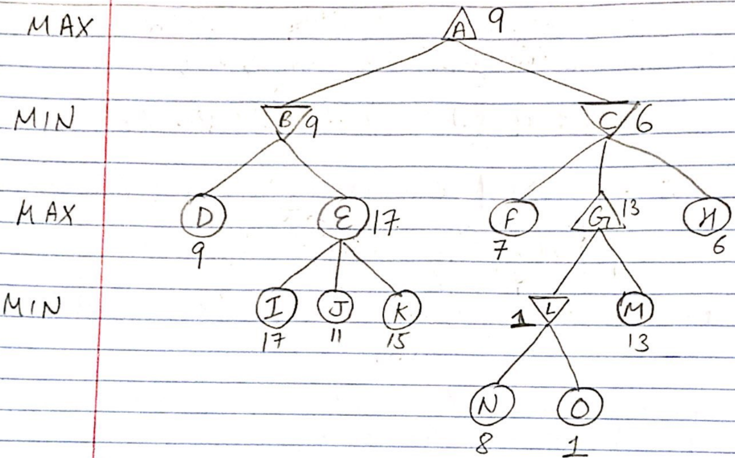
f) True.
Justification: Consider the example of vacuum cleaner. In one scenario, the vacuum cleaner only sucks when the tile is dirty, and its goal is to remove all dirt. The other scenario is when it needs to clean each square and it suck the tile anyways even if its dirty or not. In both the cases, the task environment is different, and the agent is rational.

g) False.
Justification: Consider the taxi-driver who needs to know about the other vehicles on the road. In an unobservable environment, it is impossible for a taxi-driver to make decision without any knowledge of environment, it won't be rational.

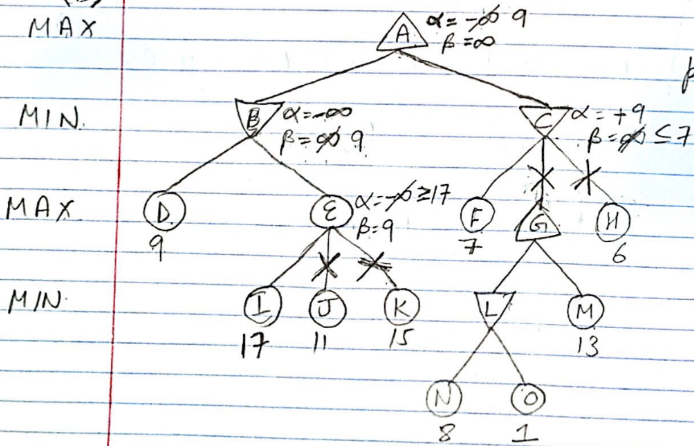
h) False.
Justification: When both the competitors are perfectly rational poker-playing agent, then one wins and other lose.

Scanned with CamScanner

Quesg (a)



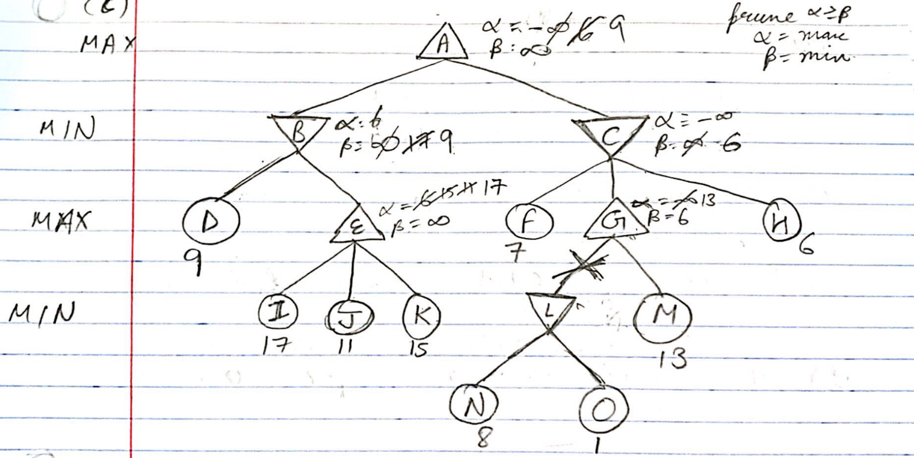
(b)



α = max
β = min.

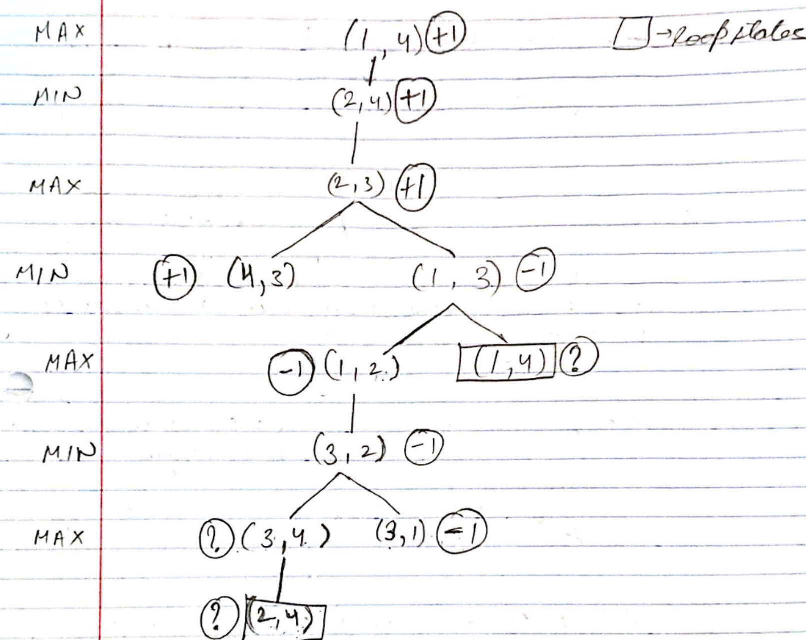
prune: $\alpha \geq \beta$

Ques 2
(c)



Scanned with CamScanner

Ques 3 (a) Initial (A,B)



(b) In this game, the minimum value obtained by A is -1 and maximum value is +1. When the loop state as terminal state is reached, the value choosen by its prefix will be to win the game. Since at both the states we check min (-1, ?) and it will always be -1 and max (+1, ?) will always be +1.
If current state's successor have only one state and is ?, then its state will be ?.

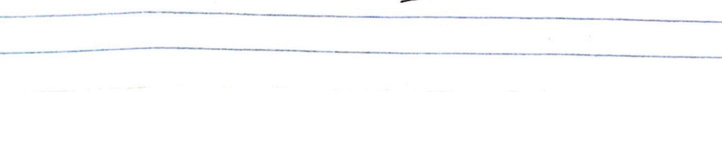
Ques 3 continued:

(c) The approach used in standard min-max algorithm is depth-first. Since we have some terminal states as loop states, the standard min-max algorithm would result in infinite loop.

It can be fixed by checking the current state on stack and if it is present, it means it has already been checked and thus it is a loop state. When it is detected, the "?" is returned and will be handeled as discussed in part (b).

This algorithm does not give optimal decisions for all games with loops as some terminal states can also be draw state because of having different values at terminal states.

(d) In the 4-square game, player A has winning strategy as it moves first. When A moves first the game can be finished in 3 steps i.e.



A wins.

Ans 3(d) continued

when $n > 2$, if $n = \begin{cases} \text{even} & \text{, player A has chance to win} \\ \text{odd} & \text{, player B has chance to win.} \end{cases}$

Scanned with CamScanner

Ques 4:-

(a) Emily is a surgeon or a lawyer

Occupation(emily, surgeon) $\vee$ Occupation(emily, lawyer).

(b) Joe is an actor, but he also holds another job.

Occupation(joe, actor) $\wedge \exists o$ [Occupation(joe, o) $\wedge \neg$(o = actor)]

(c) All surgeons are doctors

$\forall x$ [Occupation(x, surgeon) $\supset$ Occupation(x, doctors).]

Scanned with CamScanner

Ques 4 continued

(d) Joe does not have a lawyer

$$\neg \exists l\,[\text{Occupation}(l, \text{lawyer}) \wedge \text{Customer}(\text{joe}, l)]$$

(e) Emily has a boss who is a lawyer.

$$\exists l\,[\text{Boss}(l, \text{emily}) \wedge \text{Occupation}(l, \text{lawyer})]$$

(f) There exists a lawyer all of whose customers are doctors.

$$\exists l\ \text{Occupation}(l, \text{lawyer}) \wedge [\forall d\ \text{customer}(d\ l) \supset \text{Occupation}(d, \text{doctor})]$$

(g) Every surgeon has a lawyer

$$\forall s\ \text{Occupation}(s, \text{surgeon}) \supset [\exists l\ \text{customer}(s, l) \wedge \text{Occupation}(l, \text{lawyer})]$$

Scanned with CamScanner