VI SEMESTER   B.Tech. (MCE)

END TERM EXAMINATION   *May-2025*

COURSE CODE: MC312   **COURSE TITLE: Artificial Intelligence**

Time: 03 Hours   *Max. Marks: 40*

Note : Attempt **any five** questions. All the questions are of 8 marks each. Assume suitable missing data, if any.

Q.1. (a). Explain how the following statements will be stored in Prolog:

a. Abhishek is happy.

b. Rahul listens to music.

c. Abhishek plays guitar if he listens to music and he is happy.

d. Rahul plays guitar if he listens to music or he is happy.

What will the output of the query "?- playsGuitar(Rahul)" in Prolog?

[4 marks][CO5][L2]

(b). Discuss, with an example, the concept of CUTS in Prolog.

[4 marks] [CO5][L2]

Q.2. (a). Given the information below for two attributes and a class label: [4 marks] [CO6][L6]

Attribute 1	Attribute 2	Class Label
T	F	+
T	T	+
T	T	+
T	F	-
T	T	+
F	F	-

F	F	-
F	F	-
T	T	-
T	F	-

Evaluate the information gain for both the attributes. Hence, determine which attribute is better for building the decision tree classifier.

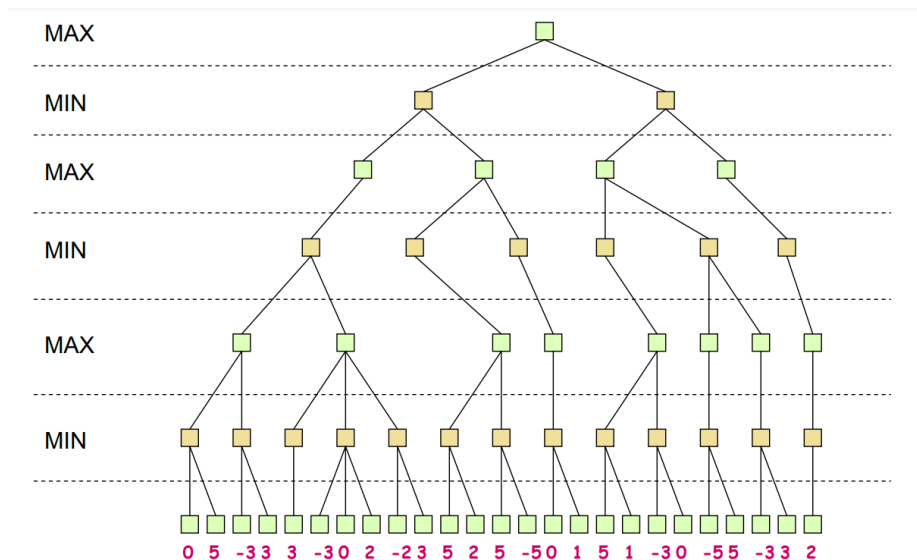(b). Consider the data given below: [4 marks] [CO6][L6]

A	B	C	Class Label
0	0	0	+
0	0	1	-
0	1	1	-
0	1	1	-
0	0	1	+
1	0	1	+
1	0	1	-
1	0	1	-
1	1	1	+
1	0	1	+

Given a test sample [A=0 B=1 C=0]. How can you predict the class label for this given test sample with Naïve Bayes classifier ?

Q.3. Given an initial state: {On(A, B), OnTable(B), On(C, D), OnTable(D), ArmEmpty, clear(A), clear(C)}. Suppose the goal state is {On(A, D), On(C, B)}. Explain how Plan Space Planning will achieve this goal state. Also write down the plan returned by the algorithm that will achieve the given goal state.   [8 marks] [CO2][L1]

Q.4. (a). Consider a game tree given below that consists of alternate levels for MAX and MIN players. The evaluation function for each of the leaf nodes is written in the last level. The evaluation function values for the leaf nodes starting from the leftmost leaf to the rightmost leaf

node is {0, 5, -3, 3, 3, -3, 0, 2, -2, 3, 5, 2, 5, -5, 0, 1, 5, 1, -3, 0, -5, 5, -3, 3, 2}. Evaluate the number of alpha cutoffs and beta cutoffs on the game tree if we apply the Alpha-Beta pruning technique on this given tree. Also, describe which leaf nodes will be evaluated and which leaf nodes will be pruned with Alpha-Beta pruning.   [5 marks][CO3][L5]


```
MAX
MIN
MAX
MIN
MAX
MIN
    0 5 -3 3 3 -3 0 2 -2 3 5 2 5 -5 0 1 5 1 -3 0 -5 5 -3 3 2
```

(b). Consider the game tree given in the above question. If we apply MIN-MAX algorithm, will the MAX make the same move as selected with the Alpha-Beta technique ?   [3 marks][CO3][L5]
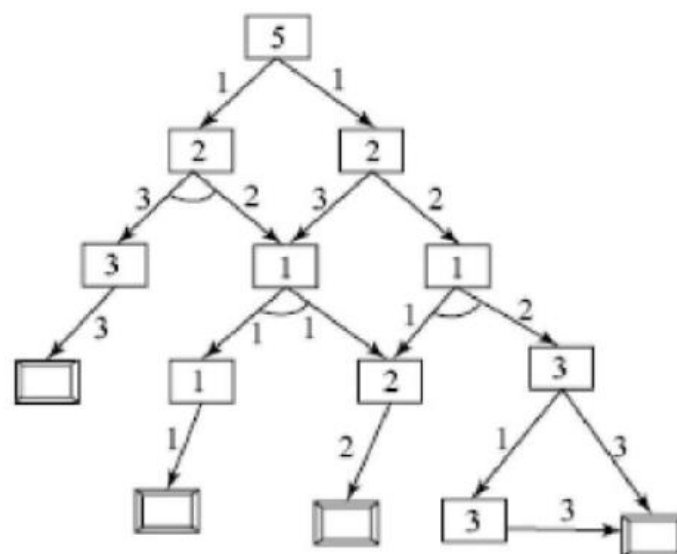
Q.5. Consider the following sentences:

(i) John likes all kinds of food.

(ii) Apples are food.

(iii) Chicken is food.

(iv) Anything anyone eats and if he/she is not killed by is food.

(v) Bill eats peanuts and is still alive.

(vi) Sue eats everything Bill eats.

Translate the above sentences into formulas in Predicate Logic. Further, prove that the statement "John likes peanuts" is true using predicate logic. [8 marks][CO4][L3]

Q.6. (a). Consider the following AND OR graph. The terminal nodes (marked by double line) are completely solved and have zero cost. The arcs represent the cost of transforming. Values written inside the nodes are the heuristic values of solving that node. Run the AO* algorithm on the graph and determine the cost of solving the problem. Also determine whether the cost returned by the AO* algorithm is the optimal cost for this problem?

[5 marks][CO1][L4]

(b). Explain how Divide and Conquer Frontier Search prunes the closed list for any puzzle. [3 marks] [CO1][L4]

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