Course Code : CDT 206 **SUVT/MS – 22 / 2668**

Fourth Semester B. Tech. (Computer Science and Engineering / Data Science) Examination

ARTIFICIAL INTELLIGENCE

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Read the questions carefully.
(2) Draw neat and clean diagram wherever necessary.

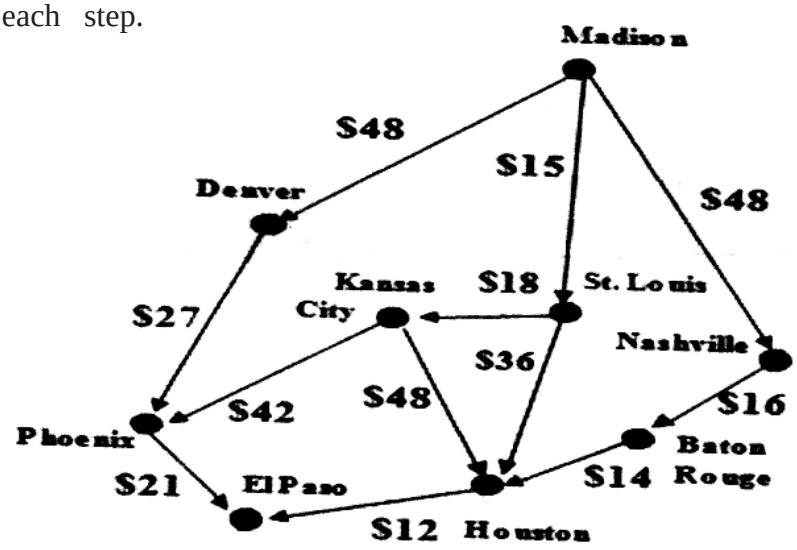
1. (a) The missionaries and cannibals problem is usually stated as follows : Three missionaries and three cannibals are on one side of the river along with the boat that can hold one or two people. Find a way to get everyone to the other side, without ever leaving a group of missionaries in one place outnumbered by cannibals in that place :

(i) Formulate this problem as a search : i.e. give a state space representation, start state, goal state and operators.

(ii) Draw the search tree and show the final solution. 6 (CO 1)

(b) Give the various classifications of Agents. Explain simple and model based reflex agent using suitable block schematic. 4 (CO 1)

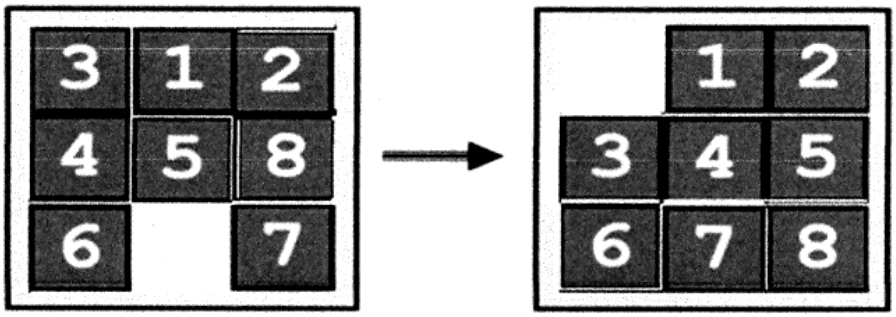
2. (a) Consider a following map where salesperson wants to travel from Madison to E1 Paso. Apply BFS (tree version) and show the content of frontier in each step.



5 (CO 1)

(b) What are the advantages of Uniform Cost Search (UCS) over Breadth First Search (BFS) ? Compare UCS and BFS with respect to completeness, time and space complexity, optimality. 5 (CO 1)

3. (a) Write an algorithm for Best First Search. Apply this algorithm to solve the following problem by selecting heuristic function as a no. of incorrect tiles. Draw solution tree from initial state up to depth 3.



Initial state Goal state

7 (CO 1)

(b) Mention drawbacks of Hill-climbing search and provide appropriate solution for it. 3 (CO 1)

4. (a) This problem exercises the basic concepts of game playing, using tic-tac-toe (noughts and crosses) as an example. We define X_n as the number of rows, columns, or diagonals with exactly n X's and no O's. Similarly, On is the number of rows, columns, or diagonals with just n O's. The utility function assigns +1 to any position with $X_3 = 1$ and –1 to any position with $O_3 = 1$. All other terminal positions have utility 0.
For nonterminal positions,
We use a linear evaluation function defined as
Eval (s) = $3X_2(s) + X_1(s) – (3O_2(s) + O_1(s))$.

(a) Show the complete game tree starting from an empty board down to depth 2 (i.e., one X and one O on the board), taking symmetry into account.

(b) Mark on your tree the evaluations of all the positions at depth. 6 (CO 2)

(b) Find the solution for following cryptarithmatic problem by providing unique value (from 0 to 9) to each letter :

SEND + MORE = MONEY

Find the value of M + O + N + E + Y. 4 (CO 2)

5. (a) Discover the operation of the unification algorithm on each of the following pairs of literals :

(A) f(Marcus) and f(Caesar)

(B) f(x) and f(g(y))

(C) f(Marcus, g(x, y)) and f(x, g(Caesar, Marcus)) 5 (CO 3)

(b) Write and explain resolution algorithm for predicate logic with the help of suitable example. 5 (CO 3)

6. (a) A pea is placed under one of three shells and shells are then manipulated in such a fashion that all of the three appear to be equally likely to contain the pea. Nevertheless, you win a prize if you guess the correct shell, so you make a guess. The person running the game does know the correct shell, however, and uncovers one of the shells that you did not choose and that is empty. Thus, what remain are two shells : one you chose and one you did not choose. Furthermore, since the uncovered shell did not contain the pea, one of the two remaining shells does contain it. You are offered the opportunity to change your selection to the other shell. Should you ? Work through the conditional probabilities mentioned in this problem using Bayes theorem. What do results tell about what you should do ? 6 (CO 4)

(b) With the help of a neat sketch, explain components of a typical expert System. 4 (CO 4)