

AI

Section Id :	64065364221
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	9
Number of Questions to be attempted :	9
Section Marks :	25
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653134733
Question Shuffling Allowed :	No

Question Number : 50 Question Id : 640653906763 Question Type : MCQ Calculator : Yes

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DEGREE LEVEL : AI: SEARCH METHODS FOR PROBLEM SOLVING (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406533052233. ✓ YES

6406533052234. ✗ NO

Sub-Section Number :

2

Sub-Section Id :

640653134734

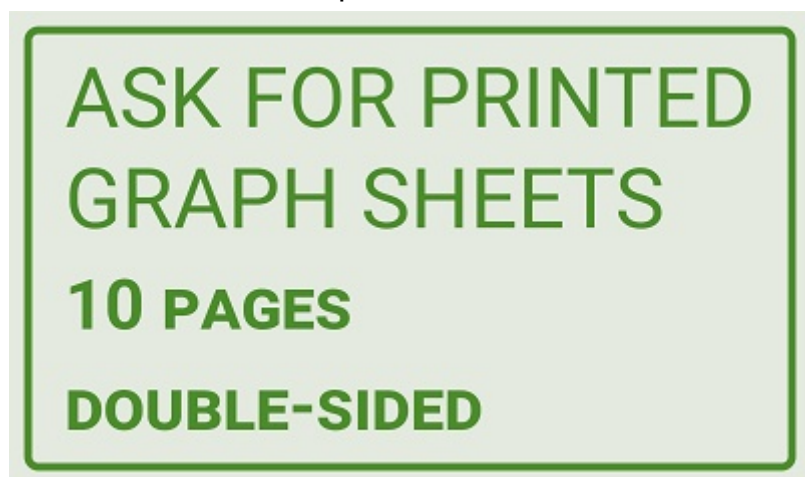
Question Shuffling Allowed :

No

Question Number : 51 Question Id : 640653906764 Question Type : MCQ Calculator : Yes

Correct Marks : 0

Question Label : Multiple Choice Question



Options :

6406533052235. ✓ Printed graph sheets were provided to me.

6406533052236. ✗ Printed graph sheets were not provided to me.

6406533052237. ✗ I did not use graph sheets.

Sub-Section Number :

3

Sub-Section Id :

640653134735

Question Shuffling Allowed :

No

Question Id : 640653906765 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (52 to 56)

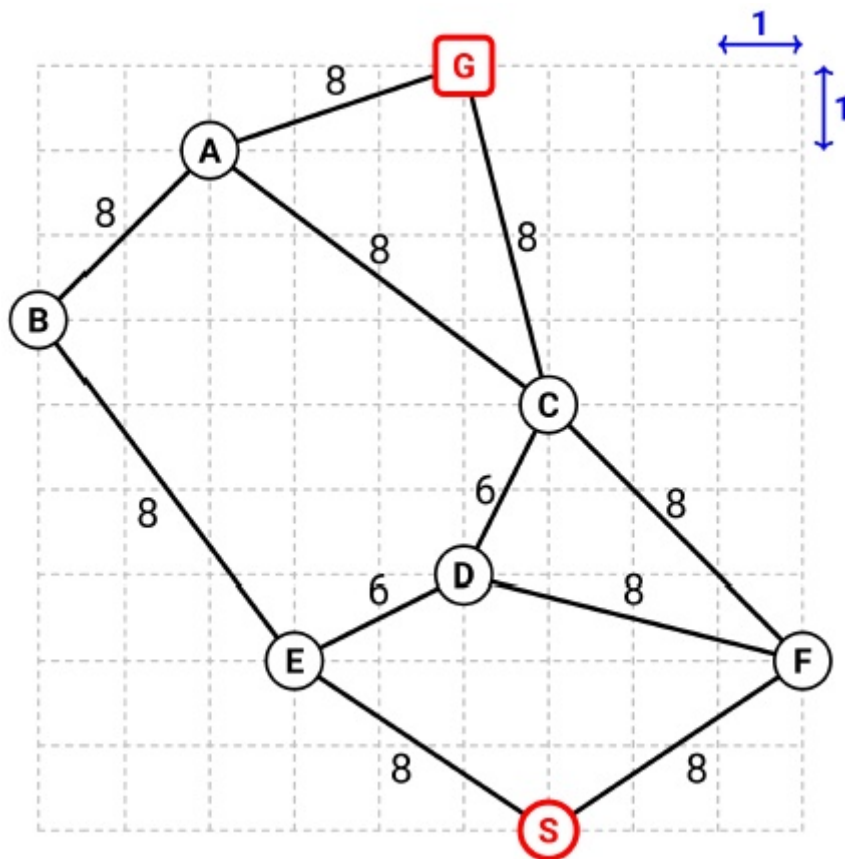
Question Label : Comprehension

SEARCH

The figure shows a map on a uniform grid where each tile is 1x1 in size.
The start node is S and the goal node is G.
The MoveGen function returns nodes in alphabetical order.

Use Manhattan Distance as the heuristic function.

Tie-breaker: If several nodes have the same cost, use node labels to break the tie.



Based on the above data, answer the given subquestions.

Sub questions

Question Number : 52 Question Id : 640653906766 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

What is the path found by the Best First Search algorithm? Enter the path as a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: S,X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

S,E,D,C,G

Question Number : 53 Question Id : 640653906767 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

What is the path found by A* search algorithm? Enter the path as a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: S,X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

S,F,C,G

Question Number : 54 Question Id : 640653906768 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

What is the path found by Branch-and-Bound search algorithm? Enter the path as a comma separated list of node labels.

Use the Branch-and-Bound variation that avoids cyclic expansions like S,A,S,A,S,A,...

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: S,X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

S,F,C,G

Question Number : 55 Question Id : 640653906769 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

For the given map, which algorithm finds the shortest path from S to G?

Options :

6406533052241. ✖ Best First Search

6406533052242. ✔ A* Search Algorithm

6406533052243. ✔ Branch-and-Bound Search Algorithm

6406533052244. ✖ None of these.

Question Number : 56 Question Id : 640653906770 Question Type : MCQ Calculator : Yes

Correct Marks : 1

Question Label : Multiple Choice Question

What can you say about the heuristic function for the given graph?

Options :

6406533052245. ✓ Admissible.

6406533052246. ✗ Inadmissible.

6406533052247. ✗ Partly admissible and partly inadmissible.

6406533052248. ✗ Cannot be determined.

Sub-Section Number :

4

Sub-Section Id :

640653134736

Question Shuffling Allowed :

No

Question Id : 640653906771 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (57 to 60)

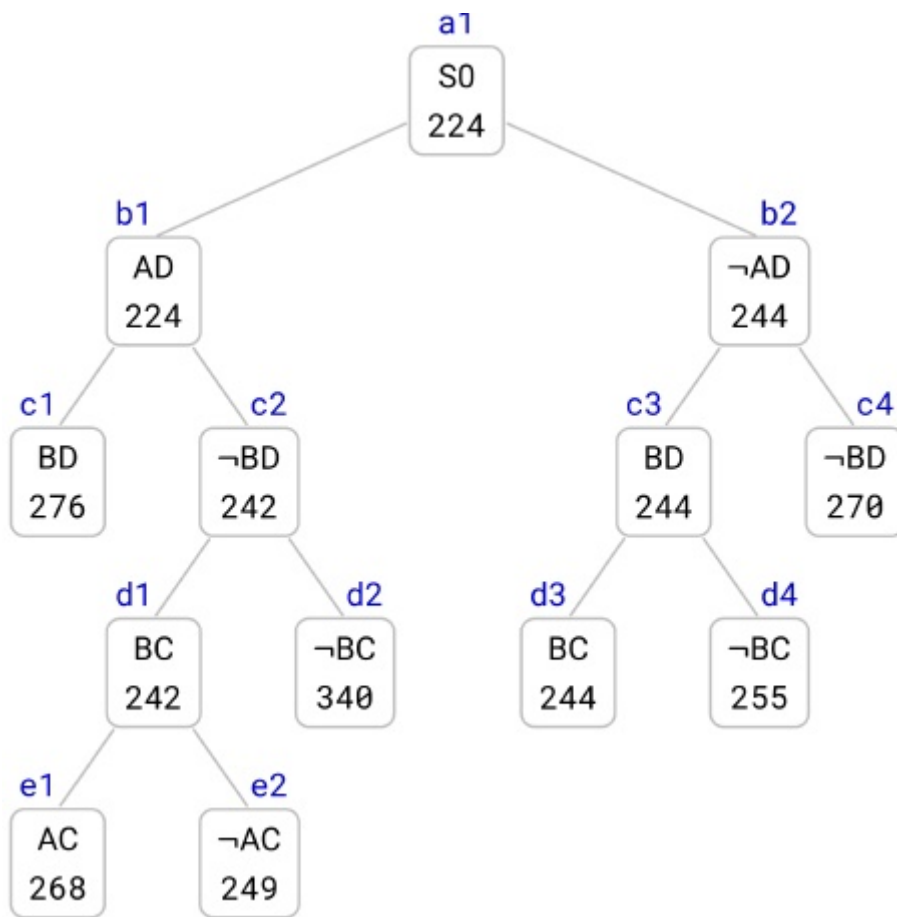
Question Label : Comprehension

TSP Branch-and-Bound

The TSP Branch-and-Bound algorithm is solving a TSP instance where the cities are A, B, C, and so on. The Branch-and-Bound search tree at the time when **the algorithm has discovered the optimal tour** is shown below.

Each node in the search tree displays an edge (either XY or \sim XY), a cost value, and a unique reference number (a1, b1, b2, c1, c2, c3, c4, d1, d2, d3, d4, e1, e2). Use the reference numbers to break ties. When required, enter the reference numbers in short answers.

What information can you glean from the search tree? Answer the sub-questions based on the information gleaned from the search tree.



Sub questions

Question Number : 57 Question Id : 640653906772 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Let S0 (ref. no. a1) be the first node to be refined, identify the next 4 nodes (2nd to 5th node) that are refined by the TSP Branch-and-Bound algorithm. Enter the nodes (node reference numbers) in the order they are refined.

Enter a comma separated list of node reference numbers.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: a9,b9,c9,d9

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

b1,c2,d1,b2

Question Number : 58 Question Id : 640653906773 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Which node represents the optimal tour and what is the cost of the optimal tour? Enter the node reference number and the tour cost in the text box, or enter NIL if it is not possible to determine the optimal tour.

Enter a node reference number followed by tour cost, separated by comma.
NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: a9,42

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

d3,244

Question Number : 59 Question Id : 640653906774 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Determine the number of cities in the TSP instance. Enter the number of cities in the text box, or enter NIL if it is not possible to determine the number of cities.

Enter an integer.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: 42

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

5

Question Number : 60 Question Id : 640653906775 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Start from city A, what is the path representation of the optimal tour? Enter the path representation in the text box, or enter NIL if it is not possible to determine the optimal tour.

Enter a comma separated list of cities (city labels).

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: A,X,Y

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Set

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

A,C,B,D,E

A,E,D,B,C

Sub-Section Number :

5

Sub-Section Id :

640653134737

Question Shuffling Allowed :

No

Question Id : 640653906776 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (61 to 64)

Question Label : Comprehension

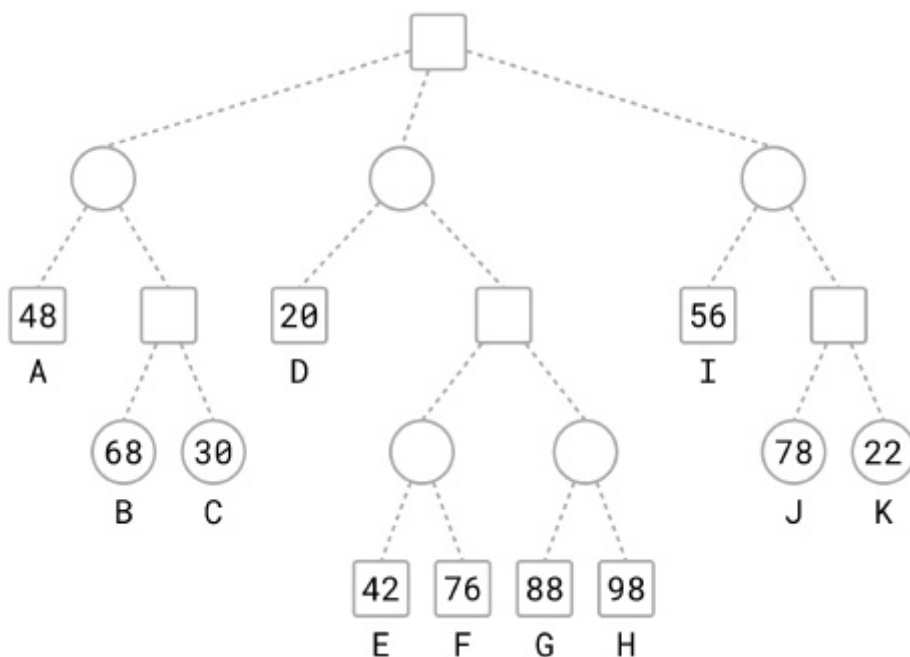
GAMES

The figure shows a game tree with evaluation function values at the leaf nodes.

The leaf nodes are labeled from A to K.

Use these labels to enter a leaf node or a list of leaf nodes in short answers (textbox).

Tie-breaker: when several nodes carry the same best cost then select the deepest node, if tie persists then select the leftmost of the deepest nodes.



Based on the above data, answer the given subquestions.

Sub questions

Question Number : 61 Question Id : 640653906777 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following is a strategy for the MAX player?

Options :

6406533052253. ✓ A,B

6406533052254. ✗ A,D,I

6406533052255. ✓ D,G,H

6406533052256. ✗ C,H,K

Question Number : 62 Question Id : 640653906778 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

List the leaf nodes in the best strategy for MAX. Enter the node labels in alphabetical order.

Enter a comma separated list of node labels in alphabetical order.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

I,J

Question Number : 63 Question Id : 640653906779 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

List the leaf nodes pruned by Alpha-Beta.

Enter a comma separated list of node labels in alphabetical order.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

C,E,F,G,H,K

Question Number : 64 Question Id : 640653906780 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

List the leaf nodes solved (assigned SOLVED status) by SSS*.

Enter a comma separated list of node labels in alphabetical order.
NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

A,D,I,J

Sub-Section Number :

6

Sub-Section Id :

640653134738

Question Shuffling Allowed :

No

Question Id : 640653906781 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (65 to 67)

Question Label : Comprehension

PROBLEM DECOMPOSITION

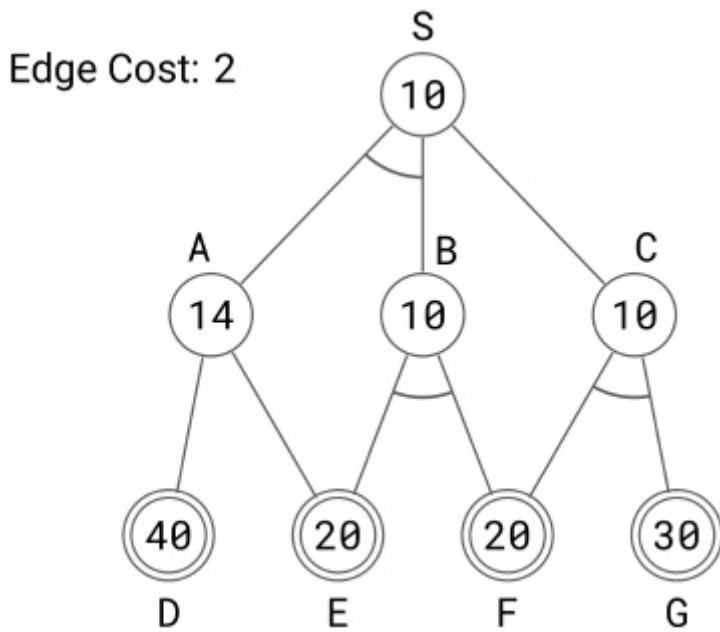
The figure shows an AND-OR graph that depicts how a problem S can be decomposed into one or more smaller problems. Nodes are uniquely identified by labels (S, A, B, ...).The number in each node is the heuristic estimate of the cost of solving that node.

Nodes shown in double lines are primitive nodes and their values are actual costs. Observe that a primitive node is added to the graph by its parent when the parent is expanded, and the primitive node is labeled as SOLVED and it will not be expanded subsequently.

The cost of each edge is 2 units.

Tie-breaker 1: If several nodes have the same cost then break the tie using node labels.

Tie-breaker 2: For AND nodes, select the unsolved branch having the highest cost.



Use AO* algorithm to solve S, then answer the given sub-questions.

Sub questions

Question Number : 65 Question Id : 640653906782 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

List the first three nodes (including S) expanded by AO* algorithm. List the nodes in the order they are expanded. Observe that primitive nodes are not expanded.

Enter a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: X,Y,Z

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Set

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

S,C,A

C,A,B

Question Number : 66 Question Id : 640653906783 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Determine the value of the start node S after each node is expanded. What are the values of S after the 1st, 2nd and 3rd nodes are expanded, respectively? Enter the 3 values in the textbox.

Enter a comma separated list of numbers.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: 12,42,17

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Set

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

12,28,36

28,36,56

Question Number : 67 Question Id : 640653906784 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

What is the final value of the start node S?

Enter a number.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Answer format: 42

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

56

Sub-Section Number : 7

Sub-Section Id : 640653134739

Question Shuffling Allowed : No

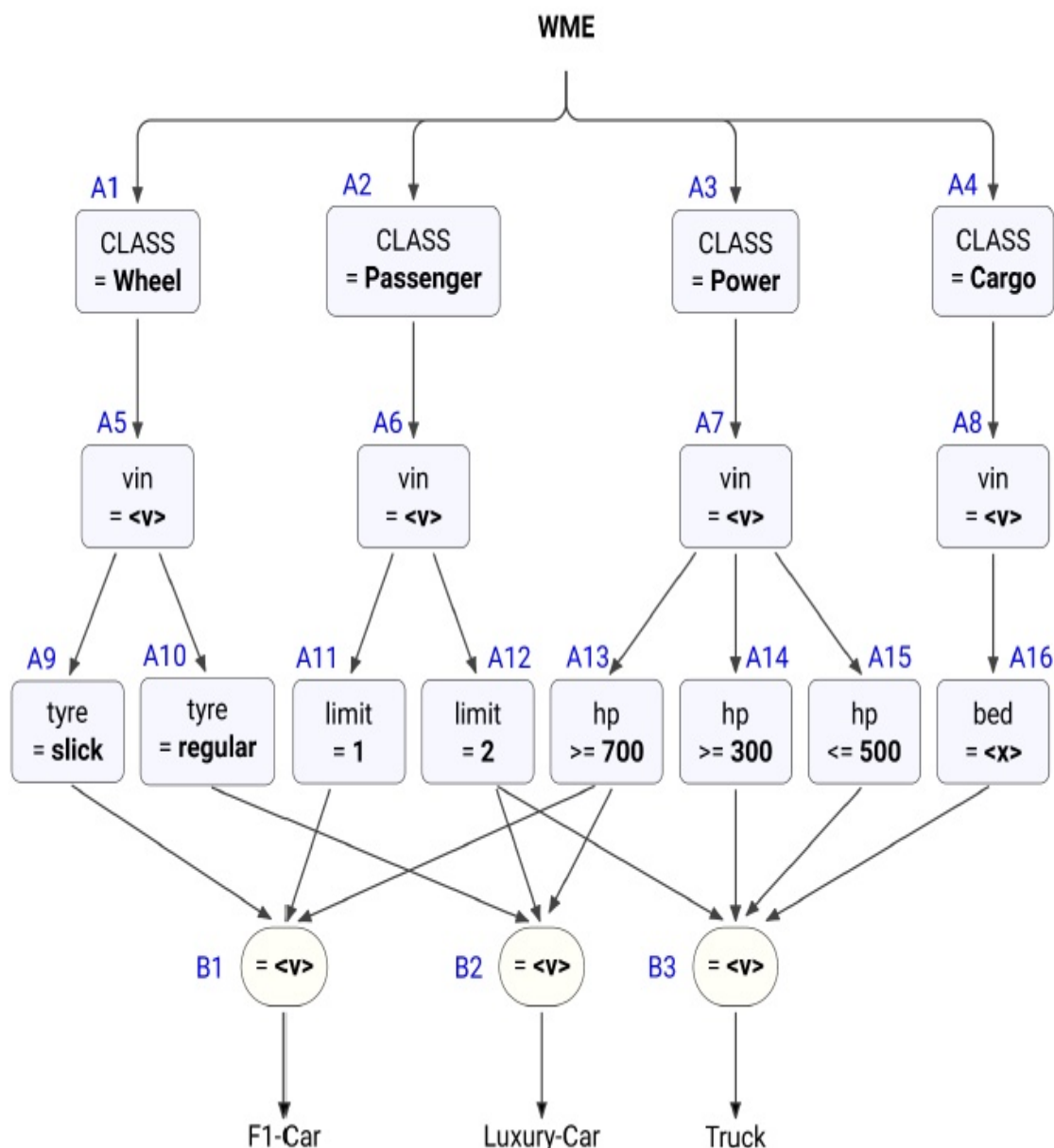
Question Id : 640653906785 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (68 to 70)

Question Label : Comprehension

RULE BASED EXPERT SYSTEMS

A Rete Net for classification of machines is shown in the figure. The labels A1, A2, A3, ..., A10, A11, A12, A13, ..., and B1, B2, B3 uniquely identify nodes in the network. When required, use the above label ordering to **break ties** and to enter short answers.



Run the Rete algorithm for the Working Memory shown below, the WMEs are in timestamp order. Assume that WMEs reside at appropriate Alpha nodes, and the Beta nodes point to WMEs residing in Alpha nodes.

101. (Cargo ^vin A1 ^bed flat)
102. (Passenger ^vin A1 ^limit 2)
103. (Passenger ^vin B2 ^limit 2)
104. (Passenger ^vin C3 ^limit 1)
105. (Power ^vin A1 ^hp 400)
106. (Power ^vin B2 ^hp 800)
107. (Power ^vin C3 ^hp 900)
108. (Wheel ^vin B2 ^tyre regular)
109. (Wheel ^vin C3 ^tyre slick)

For each WME identify its location (node label) in the Rete Net, and prepare the conflict set for the first cycle, then answer the sub-questions.

Sub questions

Question Number : 68 Question Id : 640653906786 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following rule-data tuples are in the conflict-set?

Options :

6406533052263. ✓ F1-Car,104,107,109

6406533052264. ✓ Luxury-Car,103,106,108

6406533052265. ✓ Truck,101,102,105

6406533052266. ✗ Truck,101,103,106

Question Number : 69 Question Id : 640653906787 Question Type : MCQ Calculator : Yes

Correct Marks : 1

Question Label : Multiple Choice Question

If the Inference Engine uses **Specificity** as the conflict resolution strategy then which of the following rule-data tuples will qualify?

Options :

6406533052267. ✗ F1-Car,104,107,109

6406533052268. ✗ Luxury-Car,103,106,108

6406533052269. ✓ Truck,101,102,105

6406533052270. ✗ Truck,101,103,106

Question Number : 70 Question Id : 640653906788 Question Type : MCQ Calculator : Yes

Correct Marks : 1

Question Label : Multiple Choice Question

If the Inference Engine uses **Recency** as the conflict resolution strategy then which of the following rule-data tuples will qualify?.

Options :

6406533052271. ✓ F1-Car,104,107,109

6406533052272. ✗ Luxury-Car,103,106,108

6406533052273. ✗ Truck,101,102,105

6406533052274. ✗ Truck,101,103,106

Sub-Section Number :

8

Sub-Section Id :

640653134740

Question Shuffling Allowed :

No

Question Id : 640653906789 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (71 to 74)

Question Label : Comprehension

AUTOMATED PLANNING

The domain description of a Blocks World with a single one-armed robot is given below. This is the same domain used in the assignments.

PREDICATES

armEmpty The arm is not holding any block, it is empty.
holding(X) The arm is holding X.
onTable(X) X is on the table.
clear(X) X has nothing above it, it is clear.
on(X,Y) X is directly placed on Y.

OPERATORS

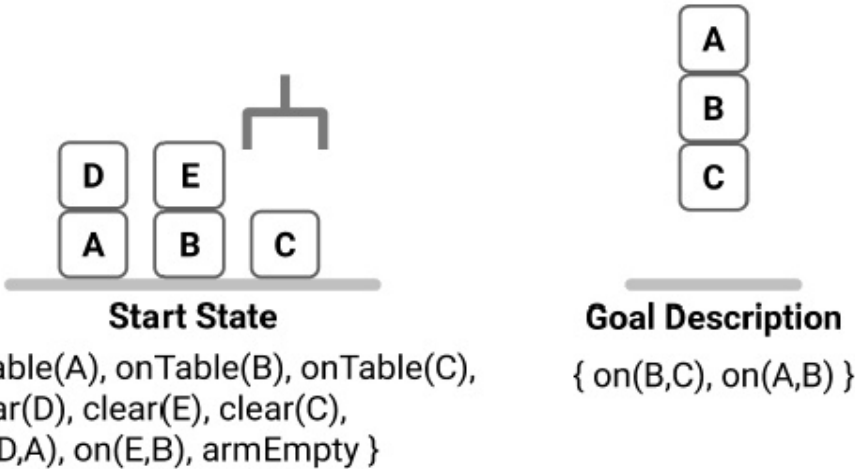
Pickup(X): pick up X from the table.
Preconditions: { armEmpty, clear(X), onTable(X) }
Add Effects : { holding(X) }
Del Effects : { armEmpty, onTable(X) }

Putdown(X): place X on the table.
Preconditions: { holding(X) }
Add Effects : { armEmpty, onTable(X) }
Del Effects : { holding(X) }

Unstack(X,Y): pick up X that is directly sitting on Y.
Preconditions: { armEmpty, clear(X), on(X,Y) }
Add Effects : { clear(Y), holding(X) }
Del Effects : { armempty, on(X,Y) }

Stack(X,Y): place X directly on top of Y.
Preconditions: { holding(X), clear(Y) }
Add Effects : { armEmpty, on(X,Y) }
Del Effects : { holding(X), clear(Y) }

Consider the planning problem with the following start state and goal description.



Based on the above data, answer the given subquestions.

Sub questions

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following are **applicable** actions in the start state?

Options :

6406533052275. ✖ Putdown(D)

6406533052276. ✔ Unstack(D,A)

6406533052277. ✔ Unstack(E,B)

6406533052278. ✔ Pickup(C)

6406533052279. ✖ Pickup(A)

6406533052280. ✖ Stack(A,B)

6406533052281. ✖ Stack(B,C)

Question Number : 72 Question Id : 640653906791 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following are **relevant** actions in the goal state?

Options :

6406533052282. ✖ Putdown(D)

6406533052283. ✖ Unstack(D,A)

6406533052284. ✖ Unstack(E,B)

6406533052285. ✖ Pickup(C)

6406533052286. ✖ Pickup(A)

6406533052287. ✔ Stack(A,B)

6406533052288. ✔ Stack(B,C)

Question Number : 73 Question Id : 640653906792 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

In the planning graph, which of the following are mutex action pairs in Layer 1?

Options :

6406533052289. ✔ Unstack(D,A), Pickup(C)

6406533052290. ✔ Unstack(D,A), Unstack(E,B)

6406533052291. ✖ Pickup(C), Stack(A,B)

6406533052292. ✖ Pickup(C), Stack(B,C)

Question Number : 74 Question Id : 640653906793 Question Type : MSQ Calculator : Yes

Correct Marks : 1 Max. Selectable Options : 0

Question Label : Multiple Select Question

In the planning graph, which of the following are mutex proposition pairs in Layer 1?

Options :

6406533052293. ✓ clear(A), holding(E)

6406533052294. ✓ clear(A), clear(B)

6406533052295. ✗ clear(C), on(D,A)

6406533052296. ✗ clear(C), holding(E)

Sub-Section Number :

9

Sub-Section Id :

640653134741

Question Shuffling Allowed :

No

Question Id : 640653906794 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

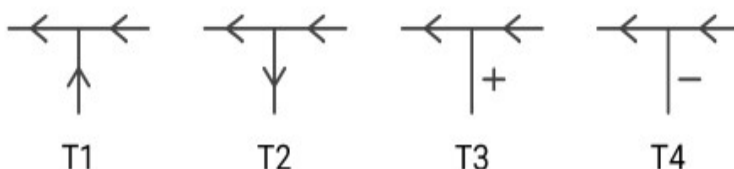
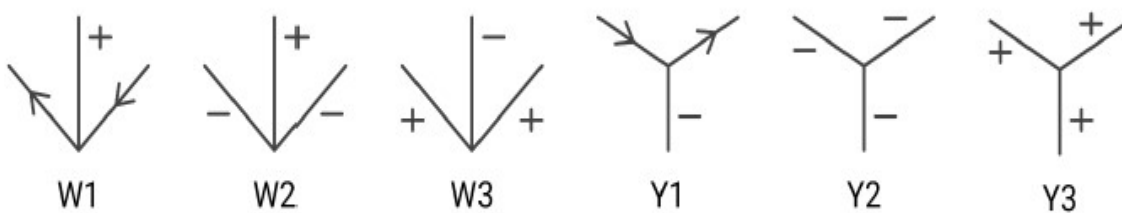
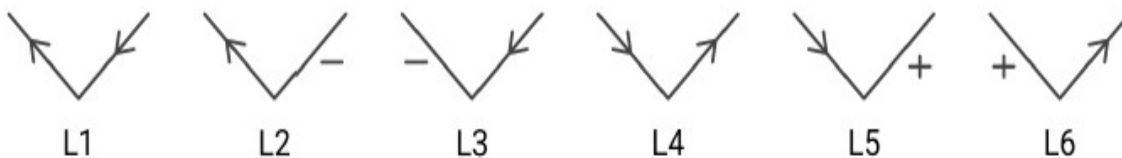
Question Numbers : (75 to 76)

Question Label : Comprehension

CONSTRAINT SATISFACTION

The set of junctions (L, W, Y and T type junctions) that occur in a 2D line drawing of trihedral objects is provided below. The in-plane clockwise/counterclockwise rotations of these junctions are valid as well. These junctions provide constraints on the possible edge assignments (convex, concave, arrow) for the edges/lines in 2D line drawings of trihedral objects.

The junctions carry unique labels: L1, L2, L3, L4, L5, L6, T1, T2, T3, T4, W1, W2, W3, Y1, Y2, Y3. When required, use the labels in short answers.



Note: A 2D line drawing of trihedral objects is considered to be consistent if all the edges and junctions can be assigned labels that are consistent with each other, otherwise the drawing is considered to be inconsistent and all labels are reset to NIL.

Apply a suitable algorithm to assign consistent labels to edges/junctions in the 2D line drawings in the given sub-questions. Choose a suitable edge and junction order for solving the problems.

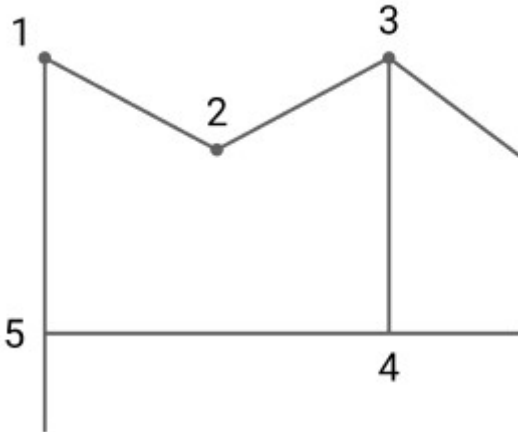
Sub questions

Question Number : 75 Question Id : 640653906795 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Assign consistent labels to all the edges and junctions in the 2D line drawing shown below. Enter the labels of the junctions 1, 2, 3, 4 in the text box, in that order. Enter NIL if the drawing has no consistent label assignment.



Enter a comma separated list of junction labels, or enter NIL.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Set

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

L4,L2,W2,T3

L6,L6,W1,T3

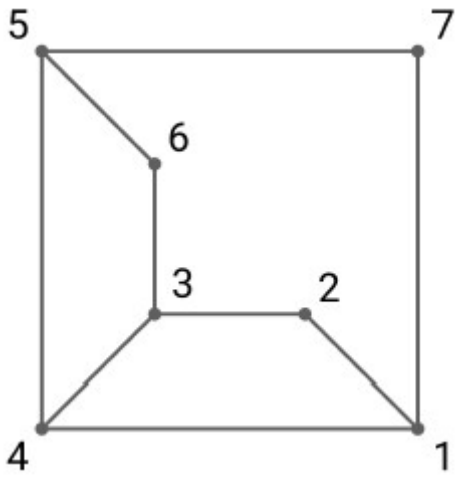
Question Number : 76 Question Id : 640653906796 Question Type : SA Calculator : None

Correct Marks : 1

Question Label : Short Answer Question

Assign consistent labels to all the edges and junctions in the 2D line drawing shown below.

Enter the labels of the junctions 1, 2, 3, 4 in the text box, in that order. Enter NIL if the drawing has no consistent label assignment.



Enter a comma separated list of junction labels, or enter NIL.
NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.

Response Type : Alphanumeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Answers Case Sensitive : No

Text Areas : PlainText

Possible Answers :

NIL