



Exam :

Quiz 2

Subject :

AI

Total Marks :

25.00

QP :

2023 Dec: IIT M AN2 EXAM QDB2

Exam Mode

Learning Mode

View Question Paper Summary

## QUESTION MENU

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32				

## TIMER

00:14



## CONTROLS

SUBMIT EXAM

Your Score

**0.00 / 25.00**

(0%)

Question 1 : 640653691186

Total Mark : 0.00 | Type : MCQ

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 :

☐ YES

☐ NO

Your score : 0

 Discussions (0)



**Question 2 : 640653691187**

Total Mark : 0.00 | Type : MCQ

Printed graph sheets (hard copy) will be provided for registered candidates only.



OPTIONS :

☐ Printed graph sheets were provided to me.

☐ Printed graph sheets were not provided to me.

☐ I did not use graph sheets.

Your score : 0

 Discussions (0)

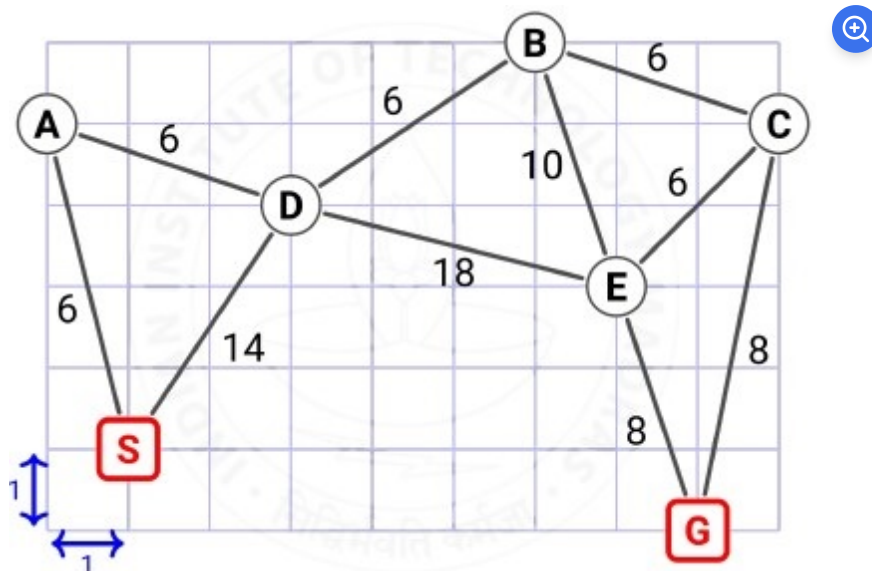


**Question 3 : 640653691188**

Total Mark : 0.00 | Type : COMPREHENSION

## SEARCH

The figure shows a map with several locations on a grid where each tile is 1x1 in size. The locations are at grid points and are connected by two way edges (roads), where each edge has a cost that is the same in both directions. Observe that the edge costs are not necessarily proportional to the coordinate based distance estimates. The start node is S and the goal node is G, the MoveGen function returns neighbours in alphabetical order. Use Manhattan distance as the heuristic function. Tie-breaker: when several nodes have the same best cost, use alphabetical order to break ties. Emulate A\*, WA\* and Branch-and-Bound on the given map, then answer the subquestions.



Your score : 0



## Question 4 :

640653691189



View Parent QN



View Solutions (0)

Total Mark : 1.00 | Type : SA

In the map, S is the first node to be refined, determine the next 4 nodes from the 2nd to 5th node refined by A\*. Enter the nodes in the order they are refined. Enter a comma separated list of node labels. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: W,X,Y,Z

Answer (Alphanumeric):

Answer

Accepted Answer : A,D,B,C


Your score : 0

 Discussions (0)



Question 5 :  
640653691190

 View Parent QN

 View Solutions (0)

Total Mark : 1.00 | Type : SA

For the 4 nodes listed in the **previous question**, list the f-values of those nodes as a comma separated list. Use the same node order used in the previous question. Enter a comma separated list of natural numbers. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 2,7,1,8

Answer (Alphanumeric):

Answer

Accepted Answer : 19,21,26,30

Your score : 0

 Discussions (0)



Question 6 :  
640653691191

 View Parent QN

 View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the path found by A\*? Enter the path as a comma separated list. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: S,X,Y,Z,G

Answer (Alphanumeric):

Answer

Accepted Answer : S,A,D,B,C,G

Your score : 0

[Discussions \(0\)](#)**Question 7 :**  
**640653691192**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

A\* may revise the f-values of nodes when it visits them again. List all the f-values assigned to node 'E', excluding +INFINITY (or +LARGE) assigned initially. Enter a comma separated list of f-values. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 3,1,4

Answer (Alphanumeric):

Accepted Answer : 34,32

Your score : 0

[Discussions \(0\)](#)**Question 8 :**  
**640653691193**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

For w=3, what is the path found by WA\* algorithm? Enter the path as a comma separated list. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: S,X,Y,Z,G

Answer (Alphanumeric):

Accepted Answer : S,D,B,E,G

Your score : 0

[Discussions \(0\)](#)

**Question 9 :**  
**640653691194**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

What is the cost of the path found by Branch-and-Bound algorithm? Enter a natural number. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS.  
Answer format: 17

Answer (Numeric):

Answer

Accepted Answer : 32

Your score : 0

[Discussions \(0\)](#)**Question 10 :**  
**640653691195**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MCQ

Is the heuristic admissible in the given map?

OPTIONS :

- ☒ Yes
- ☐ No
- ☐ Cannot be determined

Your score : 0

[Discussions \(0\)](#)**Question 11 : 640653691210**

Total Mark : 0.00 | Type : COMPREHENSION

**AUTOMATED PLANNING**

The domain description of a blocks-world with a single one-armed robot is provided below. Note: this is the same domain description used in the weekly assignments.

Tie-breaker: When actions are chosen non-deterministically, choose actions that lead to a plan. Throw away the actions that lead to deadends and cycles. Tie-breaker: Treat the goal description, preconditions and effects as lists that are accessed from left to right. When the elements in a list are pushed one by one to a stack, the last element in the list will be at the top of the stack. It has the effect of reversing the list. A planning problem is given below, find a plan using the operators and predicates defined in the blocks-world domain.

### PREDICATES

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

### OPERATORS

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

`Putdown(X)` - Place X directly on the table.  
 Preconditions: { `holding(X)` }  
 Add-Effects : { `armEmpty`, `onTable(X)` }  
 Del-Effects : { `holding(X)` }

`Unstack(X,Y)` - Pick up X that is directly 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 Y.  
 Preconditions: { `holding(X)`, `clear(Y)` }  
 Add-Effects : { `armEmpty`, `on(X,Y)` }  
 Del-Effects : { `holding(X)`, `clear(Y)` }

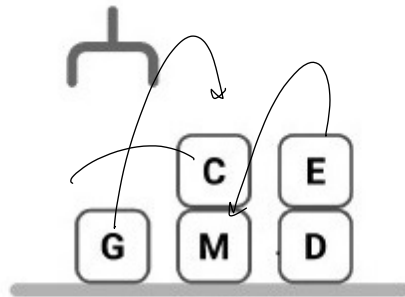
### AUTOMATED PLANNING

The domain description of a blocks-world with a single one-armed robot is provided below. Note: this is the same domain description used in the weekly assignments. Tie-breaker: When actions are chosen non-deterministically, choose actions that lead to a plan. Throw away the actions that lead to deadends and cycles. Tie-breaker: Treat the goal description, preconditions and effects as lists that are accessed from



left to right. When the elements in a list are pushed one by one to a stack, the last element in the list will be at the top of the stack. It has the effect of reversing the list. A planning problem is given below, find a plan using the operators and predicates defined in the blocks-world domain. Based on the above data, answer the given subquestions.

unstack(C,M),  
putdown(C)  
unstack(E,D)  
stack(E,M)  
pickup(G),  
stack(G,E)



**Start State**

{ onTable(G), onTable(M), onTable(D),  
clear(G), clear(C), clear(E),  
on(C,M), on(E,D) }



**Goal Description**

{ on(E,M), on(G,E) }

$m(E, M)$

$m(G, E)$

$\{m(G, E), m(E, M)\}$   
 $m(G, E) \checkmark$   
 $m(E, M) \checkmark$

Your score : 0



**Question 12 :**  
**640653691211**

[View Parent QN](#)

[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

What is the length of the optimal plan? Enter the number of actions in the optimal plan. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 42

Answer (Numeric):

Answer

Accepted Answer : 6

Your score : 0

[Discussions \(0\)](#)





**Question 13 :**  
**640653691212**

[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MSQ

Which of the following are **applicable** actions for the given planning problem?

OPTIONS :

- ☐ Pickup(D)
- ☐ Pickup(G)
- ☐ Pickup(M)
- ☐ Unstack(C,M)
- ☐ Unstack(E,D)

Your score : 0

[Discussions \(0\)](#)

**Question 14 :**  
**640653691213**

[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MSQ

Which of the following are **relevant** actions for the given planning problem?

OPTIONS :

- ☐ Pickup(G)
- ☐ Stack(E,M)
- ☐ Stack(G,E)
- ☐ Unstack(C,M)
- ☐ Unstack(E,D)

Your score : 0

[Discussions \(0\)](#)

**Question 15 :**  
**640653691214**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MCQ

Which of the following can be pushed as the first three elements onto the stack by the Goal Stack Planning algorithm? In the representation below the stack has a bottom on the right marked by the entry END. Use appropriate tie-breakers listed.

OPTIONS :

- ☐ { on(E,M), on(G,M) }; on(E,M); on(G,M); END
- ☐ { on(E,M), on(G,M) }; on(G,M); on(E,M); END
- ☐ on(G,M); on(E,M); { on(E,M), on(G,M) }; END
- ☐ on(E,M); on(G,M); { on(E,M), on(G,M) }; END

Your score : 0

[Discussions \(0\)](#)**Question 16 :**  
**640653691215**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MCQ

For the subgoal ordering given in the goal description (and using the given tie breaking rules), which of the following is the first action popped out of the stack in Goal Stack Planning?

OPTIONS :

- ☐ Pickup(G)
- ☐ Stack(G,E)
- ☐ Unstack(E,D)
- ☐ Unstack(C,M)

Your score : 0

[Discussions \(0\)](#)**Question 17 :**  
**640653691216**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MCQ

For the subgoal ordering given in the goal description (and using the given tie breaking rules), does the Goal Stack Planning algorithm find an optimal plan?

OPTIONS :

- ☐ Yes
- ☐ No
- ☐ Cannot be determined

Your score : 0

[Discussions \(0\)](#)**Question 18 :**  
**640653691217**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : MCQ

If the subgoals in the goal description are swapped places then does the Goal Stack Planning algorithm find an optimal plan?

OPTIONS :

- ☐ Yes
- ☐ No
- ☐ Cannot be determined

Your score : 0

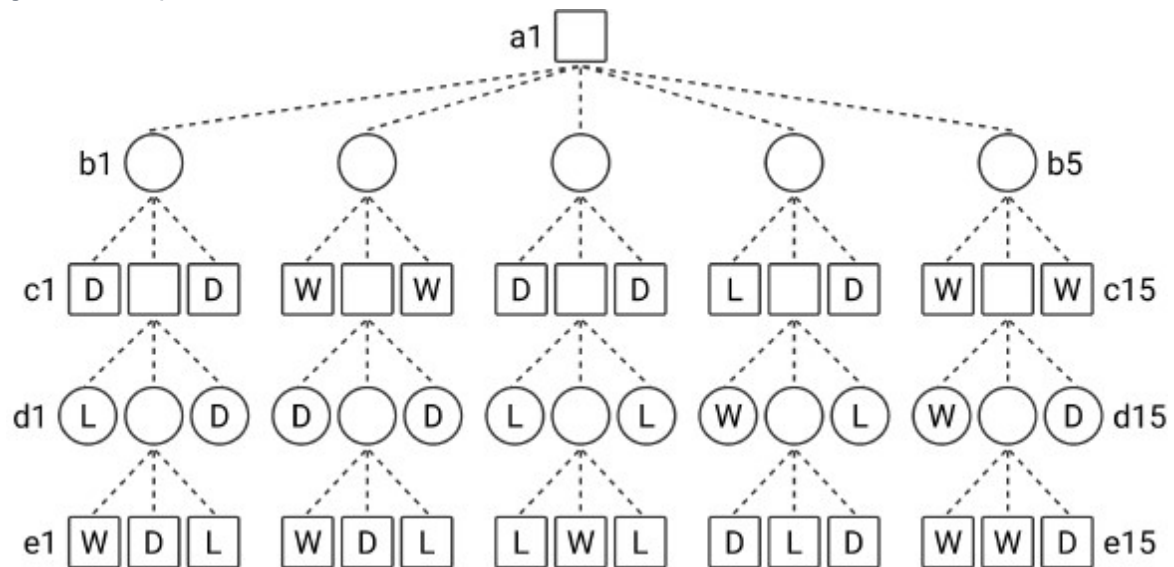
[Discussions \(0\)](#)

**Question 19 : 640653691202**

Total Mark : 0.00 | Type : COMPREHENSION

**GAMES**

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. The nodes are labeled in a level-by-level (a,b,...,e) left-to-right (1,2,...) manner as indicated in the game tree. Based on the above data, answer the given subquestions.



Discussions (0)

**Question 21 :**  
**640653691204**

View Parent QN

View Solutions (0)

Total Mark : 1.00 | Type : SA

You are allowed to change the eval of one leaf node, change the eval such that the game will end in a draw when both players play perfectly. Which node will you change and what is the new eval? Enter the label of the node you wish to change and the new eval as a comma separated list. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: a1,X

Answer (Alphanumeric):

Accepted Answer : c13,D

Your score : 0

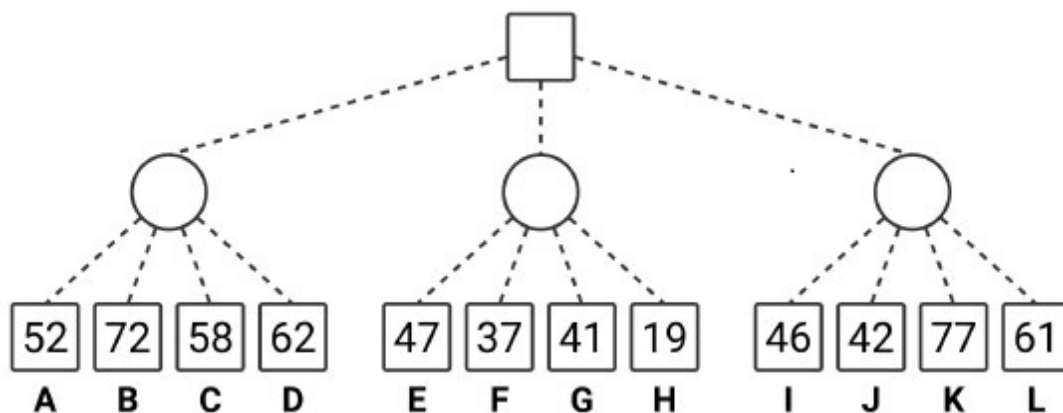
Discussions (0)

**Question 22 : 640653691205**

Total Mark : 0.00 | Type : COMPREHENSION

GAMES – AlphaBeta, SSS\*

Based on the above data, answer the given subquestions.



Your score : 0

**Question 23 :**  
**640653691206**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

List the horizon nodes in the best strategy. Enter the node labels as a comma separated list in ASCENDING order. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: X,Y,Z

**Answer (Alphanumeric):****Accepted Answer : A,B,C,D****Your score : 0**[Discussions \(0\)](#)**Question 24 :**  
**640653691207**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

List the horizon nodes pruned by Alpha-Beta algorithm. Enter the node labels as a comma separated list in ASCENDING order. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: X,Y,Z

**Answer (Alphanumeric):****Accepted Answer : F,G,H,J,K,L****Your score : 0**[Discussions \(0\)](#)

**Question 25 :**  
**640653691208**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

List the horizon nodes in the initial cluster formed by SSS\* algorithm. Enter the node labels as a comma separated list in ASCENDING order. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: X,Y,Z

Answer (Alphanumeric):

Accepted Answer : A,E,I

Your score : 0

[Discussions \(0\)](#)**Question 26 :**  
**640653691209**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

List the horizon nodes assigned SOLVED status by the SSS\* algorithm. Enter the node labels as a comma separated list in ASCENDING order. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: X,Y,Z

Answer (Alphanumeric):

*done*

Accepted Answer : A,B,C,D,E,I

Your score : 0

[Discussions \(0\)](#)**Question 27 : 640653691196**

Total Mark : 0.00 | Type : COMPREHENSION

TSP

The distance matrix and sorted segment costs for 5 cities (A to E) are provided below



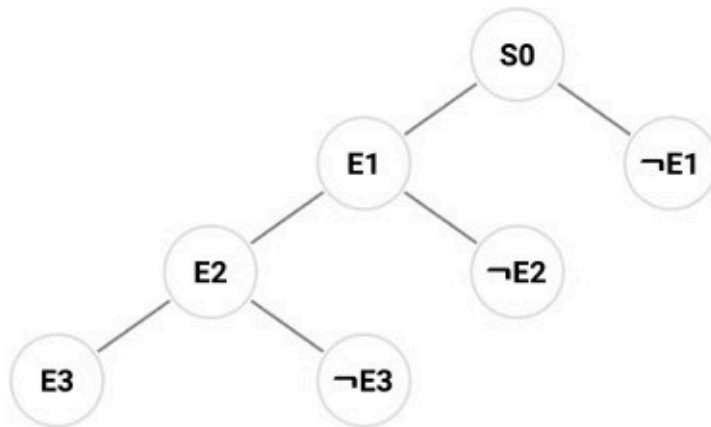
along with the BnB search tree. Use the Branch-and-Bound algorithm to compute the optimal tour. Based on the above data, answer the given subquestions.

	A	B	C	D	E
A	-	100	76	142	122
B	100	-	92	80	96
C	76	92	-	82	50
D	142	80	82	-	40
E	122	96	50	40	-

DE	CE	AC	BD	CD
40	50	76	80	82

BC	BE	AB	AE	AD
92	96	100	122	142



**Attention:** Infer as much as possible about the permanent (included/excluded) segments in the partial solutions.

Your score : 0



**Question 28 :**  
**640653691197**



View Parent QN



View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the lower bound on the cost of the tour as per the TSP BnB algorithm discussed in class? Enter a natural number. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 17

Answer (Numeric):

Answer

Accepted Answer : 342

Your score : 0

Discussions (0)



**Question 29 :**  
**640653691198**



View Parent QN



View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the first segment E1 (XY) used for refining S0? Enter edge label XY NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: XY

Answer (Alphanumeric):

Answer

Accepted Answer : DE

Your score : 0

Discussions (0)



**Question 30 :**  
**640653691199**



View Parent QN



View Solutions (0)

Total Mark : 1.00 | Type : SA

What is the cost of the node ~E1 that excludes segment XY? Enter a natural number. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 42

Answer (Numeric):

Answer

Accepted Answer : 391

Your score : 0

Discussions (0)



**Question 31 :**  
**640653691200**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

What is the second segment E2 (UV) that is used for refinement? What is the cost of the node E2. Enter the segment UV and the cost as a comma separated list. NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: UV,42

**Answer (Alphanumeric):****Accepted Answer : CE,342****Your score : 0**[Discussions \(0\)](#)**Question 32 :**  
**640653691201**[View Parent QN](#)[View Solutions \(0\)](#)

Total Mark : 1.00 | Type : SA

What is the cost of the optimal tour? NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEIOUS CHARACTERS. Answer format: 17

**Answer (Numeric):****Accepted Answer : 346****Your score : 0**[Discussions \(0\)](#)[✓ SUBMIT EXAM](#)