

Intelligent Systems – Test Block 1 (type A)
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Surname(s):

Name:

Group: A B C D E F Flip RE1 RE2

In each question, mark only one of the given options. A correct answer weighs 1, and an incorrect answer has a penalty of 1/3 (unanswered questions do not affect the score).

1) Given a RBS composed of a single rule:

```
(defrule R1
  ?f <- (lista ?x $?y ?x $?z)
=>
  (retract ?f)
  (assert (lista $?y ?x $?z))
  (printout t "The list has changed " crlf))
```

, and $WM_{initial} = \{(lista\ a\ b\ a\ b\ a)\}$, after executing the RBS, how many times the message "The list has changed " will be shown on the screen?

- A. 1
 - B. 2
 - C. 3**
 - D. 4
-

2) We have a fork lift to pick up objects from a ground floor and deliver them to the other floors of a building. In a particular problem instance there are two objects, A and B, whose destinations are the second and third floor, and weigh 2 Kg. and 8 Kg., respectively. The fork lift is at the ground floor and it cannot carry objects for more than 40 Kg. Which of the following representations **is NOT appropriate** to implement a graph search in a state-based representation?

- A. (fork-lift floor 0 load object A 2 2 object B 3 8 max-weight 40 level 0)
 - B. (fork-lift floor 0 load object A 2 2 object B 3 8) (max-weight 40)
 - C. (fork-lift floor 0 load object A 2 2 object B 3 8 level 0) (max-weight 40)
 - D. (fork-lift floor 0) (load object A 2 2 object B 3 8 level 0) (max-weight 40)**
-

3) Given the following RBS, how many rule instances will be inserted in the Agenda in the first inference cycle?

```
(defrule R1
  (lista $?x1 ?y $?x2 ?y $?x3)
=>
  (assert (lista $?x1 ?y $?x3)))
```

```
(deffacts inicio
  (lista 2 3 1 2 3 2 1))
```

- A. 4
 - B. 5**
 - C. None
 - D. 3
-

4) Given the following RBS, which of the following assertions is **CORRECT?**:

```
(defrule R1
  (declare (salience 100))
  ?f <- (lista $?x ?y)
  (test (> ?y 5))
=>
  (retract ?f)
  (assert (lista $?x)))
```

```
(defrule R2
  (declare (salience 200))
  ?f <- (lista ?y $?x)
  (test (> ?y 5))
=>
  (retract ?f)
  (assert (lista $?x)))
```

```
(deffacts inicio
  (lista 3 7 1 5 9))
```

- A. Only when the strategy of the Agenda is BREADTH, the first rule instance to be executed will be an instance of R1
 - B. Only when the strategy of the Agenda is DEPTH, the first rule instance to be executed will be an instance of R2
 - C. An instance of R1 will be always executed in the first place**
 - D. An instance of R2 will be always executed in the first place
-

5) Let the fact (heap A B A A B B A heapA heapB) be the initial state of a RBS. The fact represents an initial heap that contains blocks of type A and B and the goal is to put each block in its corresponding heap; i.e., in heapA or in heapB. Which of the following rules **DOES NOT** take a block A and moves it to heapA so that the problem can be solved?

A. (defrule move-to-heap-A
 (heap \$?x A \$?y heapA \$?z)
 =>
 (assert (heap \$?x \$?y heapA A \$?z)))

B. (defrule move-to-heap-A
 (heap \$?x ?b \$?y heapA \$?z)
 (test (eq ?b A))
 =>
 (assert (heap \$?x \$?y heapA A \$?z)))

C. (defrule move-to-heap-A
 (heap \$?x ?b \$?y heapA \$?z)
 (test (eq ?b A))
 =>
 (assert (heap \$?x ?b \$?y heapA ?b \$?z)))

D. (defrule move-to-heap-A
 (heap \$?x ?b \$?y heapA \$?z)
 (test (eq ?b A))
 =>
 (assert (heap \$?x \$?y heapA ?b \$?z)))

- 6) A given warehouse has two distinctive areas: a load area and an unload area. In each area, we can find several heaps of blocks of type A, B or C. Heaps are identified with an integer number from 1 to 5. The goal of the problem is to put blocks from the load area in a truck and take them to the unload area. Let be the initial fact:

(warehouse area load heap 1 A B C heap 2 B C B heap 3 A area unload heap 4 A B A heap 5 B A B B A)

Assuming that we wish to instance in variable ?p only the identifier of a heap of the load area whose first block is of type A, which of the following patterns **IS NOT** valid for this purpose?

- A. (warehouse area load \$?c heap ?p A \$?r area unload \$?d)
 B. (warehouse area load \$?c heap ?p A \$?r)
 C. (warehouse \$?c heap ?p A \$?r area unload \$?d)
 D. (warehouse \$?c heap ?p A \$?r 4 \$?d)

- 7) Given WMinial= {(elemento e) (lista e a e b c d e f)} and the following rules:

(defrule R1
 ; (declare (salience 10))
 (elemento ?e)
 (lista \$?a ?e \$?b)
 =>

```

(assert (lista ?e $ ?a $ ?b)))

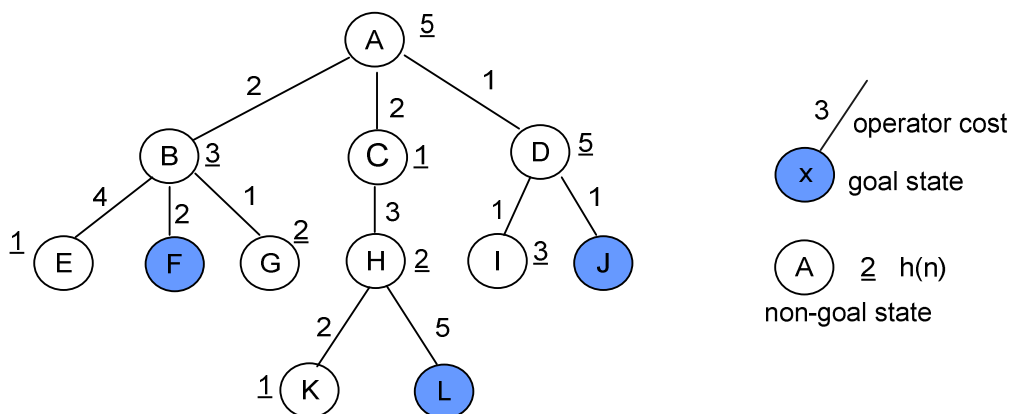
(defrule R2
  ; (declare (saliency -30))
  (lista ?a $ ?x ?a)
  (elemento ?a )
=>
  (assert (lista $ ?x)))

```

Which of the following assertions is **CORRECT**? (NOTE: the semicolon (;) before the (declare (saliency ...)) commands indicate the command is commented)

- A. The final state will depend on the search strategy (breadth, depth, uniform cost, etc.)
- B. No rule instance is ever triggered in this RBS
- C. The final state would depend on the rules priority (saliency ...) if the (declare (saliency ...)) commands were not commented
- D. The final state is the same regardless of the search strategy

8) For the search space of the figure and given a search of type A ($f(n)=g(n)+h(n)$), which of the following assertions is **CORRECT**:

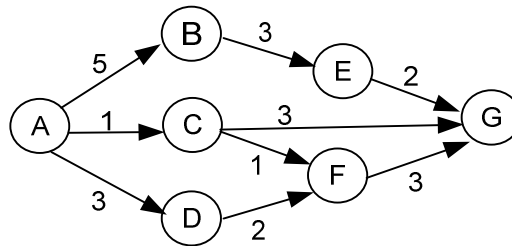


- A. The solution found by the search of type A is node J.
- B. The search of type A generates 10 nodes to find the solution.
- C. The heuristic function $h(n)$ is not admissible.
- D. None of the above.

9) Given four search methods: M1 applies Breadth-first, M2 applies Uniform Cost, M3 applies Depth-first and M4 is an Iterative-Deepening algorithm; assuming all the operators have the same cost, mark the assertion that is **INCORRECT**:

- A. M1, M2, M3 and M4 will find the optimal solution if it exists
- B. M1 and M2 guarantee the optimal solution.
- C. M4 will find the optimal solution.
- D. The memory requirements are bigger for M1 than M4.

- 10) In the graph below, the numbers on the edges represent the operator cost to go from one node to the other. Mark the assertion that is **CORRECT**.



- A. Breadth-first will find the path A-D-F-G
 - B. The cost of the solution found by a Uniform cost algorithm is 5
 - C. Breadth-first and Uniform cost will find the same solution
 - D. None of the above.
-

- 11) If we apply an Iterative Deepening algorithm over the search space of figure 10, how many iterations are necessary to find a solution?

- A. 2
 - B. 3
 - C. 4
 - D. None of the above.
-

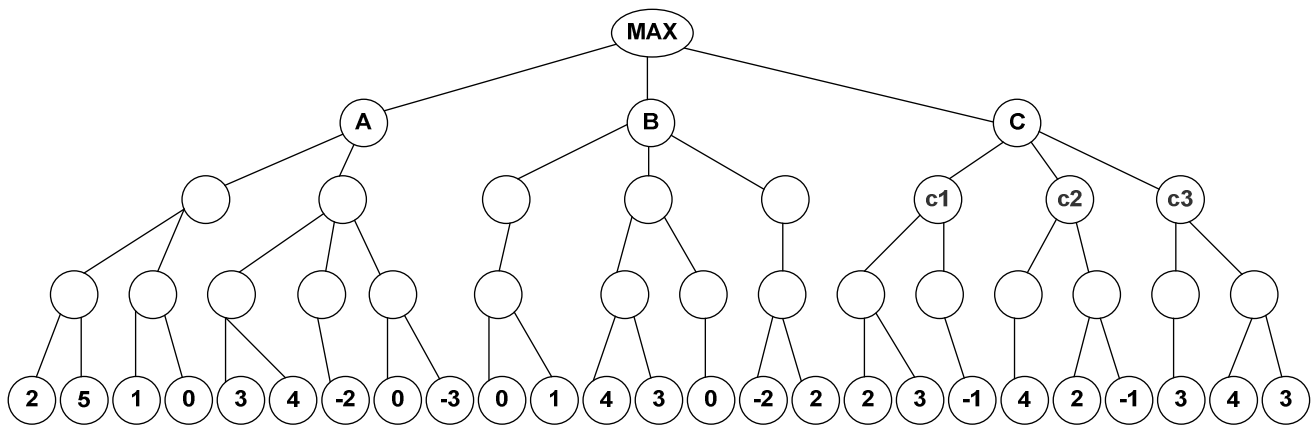
- 12) Let be a search algorithm of type A ($f(n)=g(n)+h(n)$) where $h(n)$ is admissible and consistent. The algorithm returns a solution path from the initial state A to the goal state G through a node $n1$. Which of the following assertions is **INCORRECT**?

- A. $f(A) \leq f(n1) \leq f(G)$
 - B. $f(G)=h^*(A)$
 - C. $h^*(A) < h(n1)$
 - D. $f(G)=g(G)$.
-

- 13) Let $f1(n)=g(n)+h1(n)$ and $f2(n)=g(n)+h2(n)$ be two evaluation functions for a problem such that $\forall n \ h1(n) \leq h2(n) \leq h^*(n)$. Given a search algorithm of type A that utilizes these functions, mark the assertion that is **TRUE**:

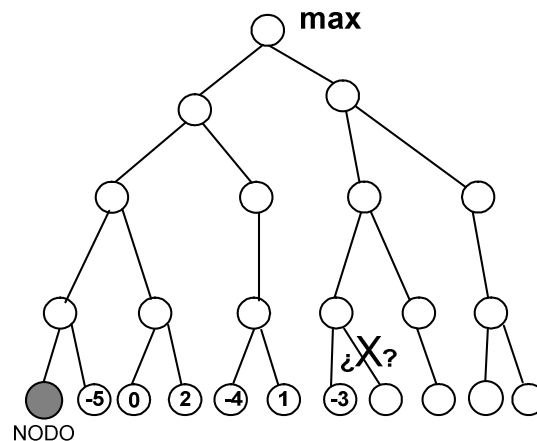
- A. Only one of the two evaluation functions will find the optimal solution
 - B. The algorithm that uses $f1(n)$ will expand fewer nodes than the algorithm with $f2(n)$
 - C. The algorithm that uses $f1(n)$ will expand more nodes than the algorithm with $f2(n)$
 - D. None of the two algorithms will develop a complete search
-

14) Given the game tree of the figure, which is the best move for MAX (root node) if we apply an alpha-beta procedure?



- A. Branch A
- B. Branch B
- C. Branch C
- D. Branch A or branch B

15) Given the game tree of the figure and assuming we apply an alpha-beta procedure:



Which value should the shadowy node (NODO) have to provoke the cut-off shown in the figure?

- A. Any value will produce the cut-off
- B. Lower than -3
- C. Higher than -3
- D. The cut-off can never happen (or none of the above answers)