

**Intelligent Systems – Test Block 1 (type B)**  
**ETSINF, Universitat Politècnica de València**  
**November 2, 2015**

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

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

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

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 mover-a-pila-A
    (pila $?x ?b $?y pilaA $?z)
    (test (eq ?b A))
    =>
    (assert (pila $?x ?b $?y pilaA ?b $?z)))
```

```
B. (defrule move-to-heap-A
    (heap $?x A $?y heapA $?z)
    =>
    (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 $?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 A $?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 \$?c heap ?p A \$?r area unload \$?d)
- C. (warehouse area load \$?c heap ?p A \$?r)
- D. (warehouse \$?c heap ?p A \$?r 4 \$?d)

- 7) Given WInitial= {(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)))

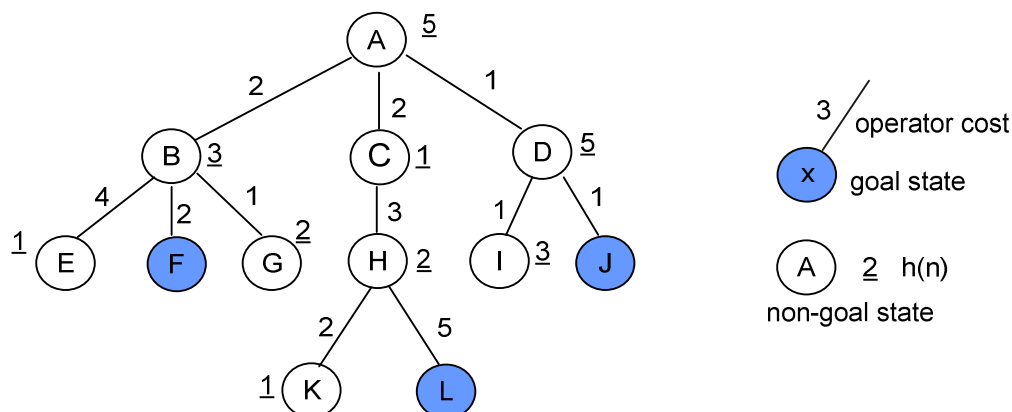
(defrule R2
  ; (declare (salience -30))
  (lista ?a $?x ?a)
  (elemento ?a )
=>
  (assert (lista $?x)))

```

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

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

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**:

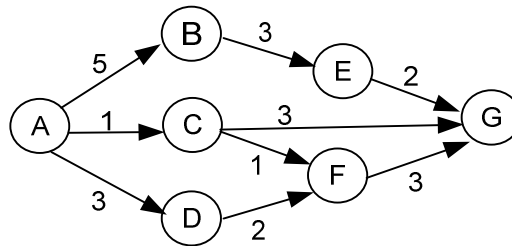


- A. The search of type A generates 10 nodes to find the solution.
- B. The heuristic function  $h(n)$  is not admissible.**
- C. The solution found by the search of type A is node J.
- D. None of the above.

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

- 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.

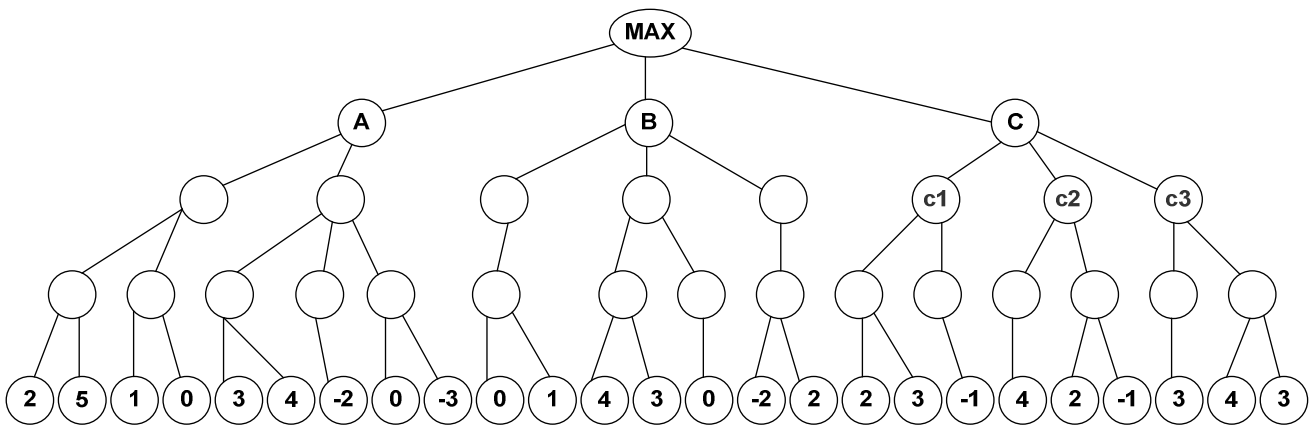
- 12) Let be a search algorithm of type A ( $f(n)=g(n)+h(n)$ ) where  $h(n)$  is admissible and consistent. The algorithm returns a solution path from the initial state  $A$  to the goal state  $G$  through a node  $n1$ . Which of the following assertions is **INCORRECT**?

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

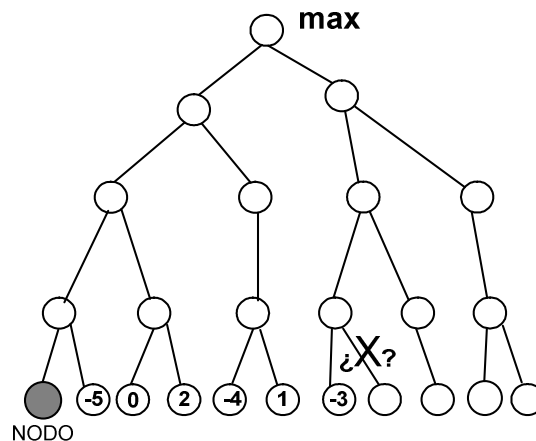
- A. Only one of the two evaluation functions will find the optimal solution
- B. None of the two algorithms will develop a complete search
- C. The algorithm that uses  $f1(n)$  will expand fewer nodes than the algorithm with  $f2(n)$
- D. The algorithm that uses  $f1(n)$  will expand more nodes than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

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

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