## MCA 4th Semester Examination, 2013

### ARTIFICIAL INTELLIGENCE

### PAPER—MCA-402

*Full Marks* : 70

*Time* : 3 hours

Answer any **five** questions

*The figures in the right-hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

1.  (*i*) Write a prolog program to delete 3 elements from the last of a list L.

    (*ii*) Write a program to calculate sum of N natural numbers.

    (*iii*) Write a prolog program to check whether a list L is palindrome or not.      5 + 4 + 5

2. A sliding-tile puzzle consists of three black tiles, three white tiles and an empty space thus

| B1 | B2 | B3 | | W1 | W2 | W3 |

There are three legal ways of moving a tile, each with an associated cost :

Slide into the adjacent empty location — cost 1.

Jump over one tile into the empty location — cost 1.

Jump over two tiles into the empty location — cost 2.

The goal is to have all the while tiles to the left of all the black tiles and to achieve this at minimum cost. The final position of the empty space is not important.

(i) Implement the problem as state space search problem.

(ii) Solve the problem.

(iii) Draw the implicit search graph.

(iv) Implement and solve the problem optimally using Depth First search.          3 + 2 + 3 + 6

**3.** (*i*) What is admissible heuristics ?

(*ii*) When we called a heuristic is consistent or satisfies monotone restrictio ?

(*iii*) What is Manhattan distance ? Is manhattan distance admissible and consistent ? Explain with example. $3+ 3 + (4 + 4)$

**4.** (*i*) Algorithm A* is run on the search graph shown in the following figure. Trace the execution of the algorithm indicating the sequence in which nodes get selected for expansion.
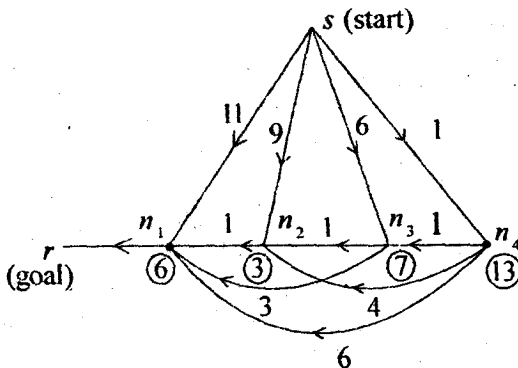
*(ii)* By tracing, you reach an optimal solution, why?

*(iii)* Is it possible to change the heuristic values of some or all modes, so that A* will output a non-optimal path to this search graph ? If so, change the heuristic values and give the output solution path in this case. Otherwise, give reasons why it is not possible.  5 + 3 + 6

5. *(i)* What is hill climbing method ?

*(ii)* What is the difference between exhaustive search and blind search technique ?

*(iii)* Prove that, if a heuristic is consistent, it must be admissible. Construct an admissible heuristic which is not consistent.  3 + 4 + 7

6. *(a)* Explain Iterative deepening depth first search and Depth Limited search ?

*(b)* What is Bidirectional search ? Write an algorithm for it ? Can we apply informed search as a searching technique in Bidirectional search, if yes suggest a method, if no then justify it ?

(3 + 3) + (3 + 3 + 2)

7. Consider the Missionaries and Cannibal problem "3 missionaries and 3 cannibals are on one side of the river. I boat carries 2. Missionaries must never be outnumbered by cannibals. Goal : All needs to cross the river".

   (a) Give the state space of the classical AI problem

   (b) Draw an implicit state space graph of the problem

   (c) Give a solution to the problem using any blind search technique.                3 + 5 + 6

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