ROLL NO. _____

Code: CT71 **Subject: ARTIFICIAL INTELLIGENCE**

ALCCS

Time: 3 Hours **DECEMBER 2015** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. What is a Turing test and what capabilities are required by a computer to pass this test?

b. Differentiate tree based breadth-first, depth-first and iterative-deepening search strategies based on completeness, time and space complexities.

c. Define minimax value with regards to optimal decision in games

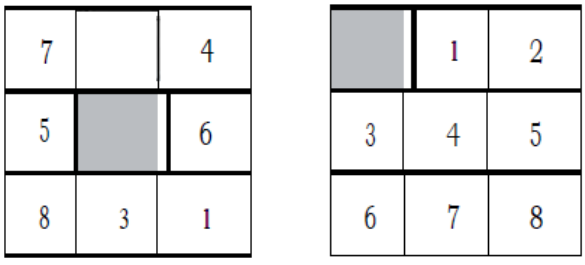
d. Provide an algorithm for converting an expression into prenex normal form.

e. List merits and demerits of frames in Knowledge Representation

f. Consider a doctor diagnosing a rare form of bowel syndrome. He knows that only 0.1% of the population suffers from that disease. He also knows that if a person has the disease, the test has 99% chance of turning out positive. If the person doesn't have the disease, the test has a 98% chance of turning negative. How feasible is this diagnostics method? That is, given that a test turned out positive, what are the chances of the person really having the disease?

g. What is a recurrent network? Give the basic flow for recurrent networks. **(7 × 4)**

Q.2 a. Consider the 8-piece sliding block problem, shown in the Figure 1. Write the standard problem formulation. (6)

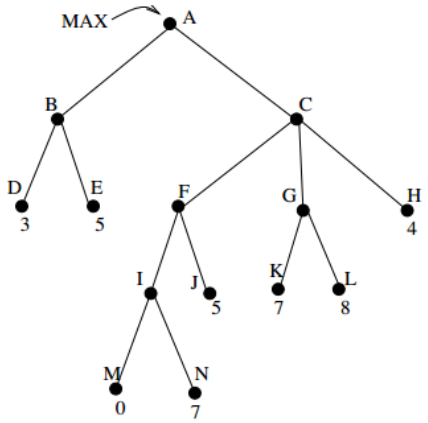


Start State Goal State

b. Explain local beam search with example in detail. **(6)**

c. How does iterative deepening help? For search in binary tree, show four iterations using iterative deepening. **(6)**

Q.3 Consider the following game tree.



a. Find the best move for the MAX player using the minimax procedure. **(6)**

b. Perform a left-to-right alpha-beta pruning on the tree. Indicate where the cutoffs occur. **(6)**

c. Perform a right-to-left alpha-beta pruning on the tree. Discuss why different pruning occurs. **(6)**

Q.4 a. In how many ways can a group of 9 people work in 3 disjoint subgroups of 2, 3 and 4 persons?
Example:
?- group3([aldo,beat,carla,david,evi,flip,gary,hugo,ida],G1,G2,G3).
G1 = [aldo,beat], G2 = [carla,david,evi], G3 = [flip,gary,hugo,ida]
...
Write a predicate using prolog that generates all the possibilities. **(9)**

b. Explain simple planning using goal stack with algorithm. **(9)**

Q.5 a. Consider the statements in the following paragraph:
"Every human, animal and bird is living thing who breathe and eat. All birds can fly. All man and woman are humans who have two legs. Cat is an animal and has a fur. All animals have skin and can move. Giraffe is an animal who is tall and has long legs. Parrot is a bird and is green in color"
For the above paragraph, provide predicate logic and semantic net representations. **(9)**

b. Provide and explain Expert System (ES) architecture illustrating role of every component. How can prolog be used with forward chaining as control strategy? **(9)**

Q.6 a. Explain Dempster–Shafer Theory with formalism, with an appropriate example **(9)**

b. Provide general architecture for multi-layer feed forward neural network. Consider the following truth table non linearly separable XOR function with argument values {-1,1}.

x_1	x_2	x_1 xor x_2
-1	-1	**-1**
-1	1	**1**
1	-1	**1**
1	1	**-1**

Provide a multi-layer feed forward neural network to realize the above non-linear separation. **(9)**

Q.7 a. Consider the Santa Fe Trail problem: The objective of this problem is to evolve a program which eats all the food on a path, without searching too much when there are gaps in the path. A sensor can see the next cell in the direction it is facing. Consider the terminals to be move, left, right: move moves forward one cell, left takes the program to immediate left cell and right takes the program to immediate right cell. Justify why Genetic programming may be an appropriate approach for solving this problem and Provide a suitable fitness function. **(4)**

b. Compare Genetic Algorithm with traditional optimizing algorithmic approaches in detail. **(7)**

c. List and justify possible applications of Genetic Algorithms. **(7)**