CSC 290	Introduction to Artificial Intelligence	Final Exam
PLEASE SUBMIT YOUR WORK ON E-Mail (Also keep a copy on sent items for just in case).		
ai@sadievrenseker.com* and *sseker@smith.edu		

Due Date: May 12, Midnight (24.00) (No submissions after this time will be accepted)

The final exam is individual, so please do not make any information exchange or do not discuss about the answers or ask anybody for help except the instructor. You can use any Internet resources for reading, you can search for the answers on any search engine (like Google) or you can use any textbooks.

For all the parts below, please provide an answer with explanations. You can submit your answers by writing in a word processor, or you can write into paper and scan/take photo and submit as an attachment to your mail.

Question 1 :

1. Which one runs faster? Breadth first search or iterative deepening search, why?
2. Greedy algorithms do not guarantee the best solution always. Can we also say so for A* ?
3. What are the drawbacks of K-NN (k – nearest neighborhood algorithm)?
4. What is linearly separable problem? Give 2 samples for each linearly separable and not linearly separable problem.
5. Give names of 2 machine learning (ML) algorithms which can work on linearly separable problems and also 2 ML algorithms which can work on problems which are not linearly separable.
6. Explain why do we need hidden layer in neural networks (or can we simply build and solve all problems with a single layer neural network (a.k.a perceptron)) ?
7. Give 2 natural language problems and their solution techniques (just names are enough).
8. What are the differences between Zero Order Logic and First Order Logic?
9. Can you use first order logic (FOL) to model the whole human intelligence? Or are there any limits? If so what are the limits of FOL?
10. What is the difference between crisp and fuzzy logic? Please express your explanation by using a fuzzy logic operator.

Question 2:

Assume that, you are hired to create an artificial intelligence chat bot system for a web store. Company wants from you to implement a new chat bot working on the web page and customers can ask questions or give orders. Your chat bot will execute the order requests and reply back.

a) What topics from the AI class, would you use in your design?
b) Create a knowledge base in first order logic and provide sample "tell" and "ask" statements.
c) Explain how would you connect natural language processing with the FOL?

Question 3:

You have given a data set below:

Hours Studied to the AI course	Hours studied to other courses	Gender	Grade
50	50	M	A
50	50	F	A
40	60	M	A
20	30	F	C
30	20	M	C
30	40	M	B
25	45	F	B
20	20	M	C
25	10	F	C
0	0	M	F
2	3	F	F
5	20	M	F
6	15	F	F
55	45	M	A
45	55	F	A
30	35	F	C
35	45	M	B
44	35	F	B

Can you come with a machine-learning algorithm and can you provide a solution for predicting the grade of student with information on other columns are given?

Explain your algorithm and training output for the above data set.

Test the success of your algorithm.

Predict the grades for below students by using your solution:

41	41	M	?
11	55	F	?

Question 4:

Inputs			Outputs	
a	b	c	x	y
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	1	1
1	0	0	1	0
1	0	1	1	1
1	1	0	0	0
1	1	1	0	1

For the truth table above, can you develop a neural network and if yes please draw and give weights and threshold values for each neuron and synapsis.

Question 5:

Tic-tac-toe game has many variants. One of the variants is called as numerical tic-tac-toe and the game definition is as below:

"You and another player take turns naming numbers one through nine. Each number may only be used once. The player who collects any three numbers that add up to 15 wins. If all numbers are used up without someone getting 15, the game is a draw."

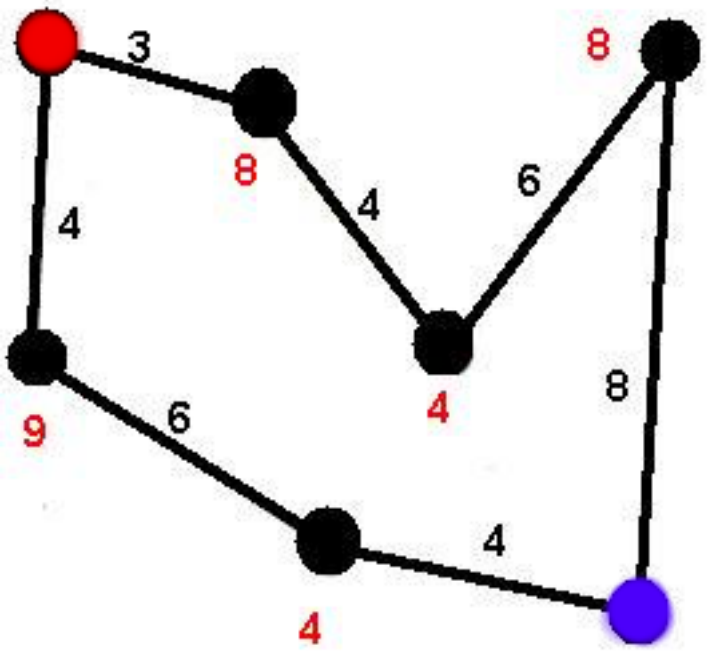
For example below board setup has 15 (win situation from all dimensions):

4	3	8
9	5	1
2	7	6

Provide a mini-max tree (game tree) for the game with below state and decide best move and explain the reason by using game tree.

4	3	
		1
2		

Question 6:



Red node indicates the starting node.
Blue node indicates the target node.
Black numbers on the edges, indicates the weight between two adjacent nodes.
Red numbers on the nodes, indicates the heuristic values of the nodes.

1) Explain (or show) the steps of Breadth First Search (BFS), Depth First Search and Uniform Cost Search on the given map above.
2) Show the steps of Iterative Deepening Search with initial depth = 0 and depth increase by 1 for each iteration. Compare the results with BFS and discuss the methods.
3) Show steps of A* algorithm for the given map above.