Artificial Intelligence

Theory

(1) Write following sentences in first order predicate logic.

   (a) *There are exactly two chocolate muffins.*

   (b) *No cat likes a smart rat.*

   (c) *The class average in English is always higher than the class average in Maths.*

   (d) *Diamond and platinum ornaments are precious.*

   (e) *I don't submit my assignments in AI course implies if I submit my assignments in AI course, then I pass the course with good grades.*

   (f) *Sharks and Whales attack if they are angry or hungry.*

   (g) *It is not the case that some fishes do not swim.*

   (h) *Marry can eat some of the candies all of the time, and she can eat all of the candies some of the time, but she cannot eat all of the candies all of the time.*

   (i) *There is a fan who likes all superheroes who are not killers.*

   (j) *There is a shopkeeper in the market who sells items only to those customers who have a membership card of the store.*

(2) There are two robotics arm V-arm and H-arm moves in vertical and horizontal direction resp. You have to plan to reach a final state. What are your actions and pre-requisite corresponding to each action? Arms not carry/pass/put object over another object.

Initial State

					X		
Q							
		X		X			
		Q			Q		
Q			X	Q		Q	
		Q		X		X	
				Q	Q		
	X						

Final State

		Q					
Q							
						Q	
				Q			
							Q
	Q						
			Q				
					Q		

Note:

   (a) Plan in such a way minimum sequence of action required and number of actions are less as much as possible.

   (b) There must be an action which allow V-arm and H-arm to move horizontally and vertically rept. think carefully while writing pre-requisite for this action.

   (c) Q and x are objects. Only V-Arm have ability to burst an object.

   (d) Starting positions: Top-Left(V-Arm) and Bottom-Right(H-arm).

(3) Formulate a planning problem for organising a Seminar at your college. Invite Professor X as the guest lecturer. Being the head of the organising committee, it is your responsibility to get necessary permissions wherever required. (State your assumptions if necessary).

Working departments in the college are Academics, Accounts, FMS, IT, Security.

(4) Exhausted by trying to finish your assignments before deadline, you decide to order parathas. You call Sonu Dhabha
      1. Find out that they have only two types of parathas left- Chenopodium and Radish:
      2. You should check if u like the filing, because you don't want to order something you will not eat
      3. You are a picky eater and will not eat some fillings - Chenopodium and Radish
      4. You will go Hungry tonight.

Convert the statements into FOL statements and use resolution to show that the fourth statement is true.

Programming

Implement Ant Colony Optimization for Travelling Salesman Problem with N cities.
1. Randomly generate a NxN distance matrix signifying the distance between the cities.
2. Visualise this distance matrix using Graph. (You may use libraries like NetworkX this part)
3. Implement Ant Colony Optimization (Do yourself)
4. Visualise the final results using Graph.
5. Compare and contrast your observation by changing various parameters of the ACO and Input such as N, Sparsity etc. Report your observation and inference in the report.

General purpose libraries are allowed for the assignment such as NumPy. But all the algorithm specific functions to the assignments are to be made from scratch.
Assumptions, Methodology, Algorithms, Observations, Results and Inference are to be included in report.
Do not include Console Output in your report, Do summarise these results into representation easy to understand such as Tables and Graphs.