NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Computer Science & Engineering

END SEMESTER EXAMINATION, July-December 2021

B. Tech.: Semester-V

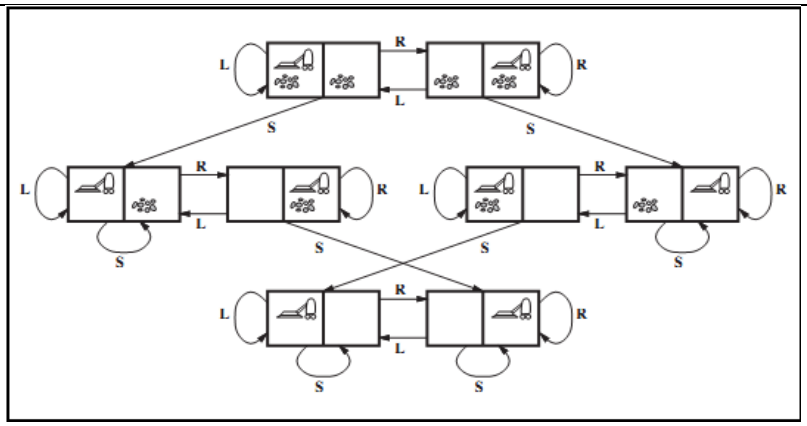
Course Name: Artificial Intelligence **Course Code: CS5402**

Maximum Time: 2 hours **Max. Marks: 40**

Instruction:

1. From question 1 to question 5 are compulsory. Question 6 and question 7 are optional in which students can attempt only one (either ques. 6 or ques. 7).
2. Assume and write any suitable data, if necessary.
3. The Marks, CO (Course Outcome) and BL (Bloom's Level) related to questions are mentioned on the right-hand side margin.

		Marks	**CO**	**BL**
1	Translate the following sentences into formulas in the First-order logic representation:	10*1=**10**	CO-2	II, VI
(i)	One's husband is one's male spouse.			
(ii)	There is not any restaurant that sells popcorns, but cinemas do.			
(iii)	A sibling is another child of one's parents.			
(iv)	Male and female are disjoint categories.			
(v)	Not all students like both AI and Compiler.			
(vi)	All Romans were either loyal to Caesar or hated him.			
(vii)	People only try to assassinate rulers they are not loyal to.			
(viii)	Only **your roll no.** is not failed in AI.			
(ix)	Anything anyone eats and isn't killed by is food.			
(x)	There is a topper who saves all back-benchers in the class who do not hard-work themselves.			
2	Explain the Goal Stack Planning (GSP) method for the Block World problem with suitable diagram and necessary functions. Also explain partial order planning.	**5**	CO-4	IV
3	Define the pseudocode of agent programs for the goal-based and utility-based agents with the help of suitable diagram.	**5**	CO-1, CO-3	I
4	Differentiate with comparison between propositional vs. first-order inference logic rules. Solve the problem using forward and backward chaining tree structure solutions (diagram) in first-order logic representation for the following knowledge-based automated reasoning agent and prove that West is a criminal:	**8**	CO-2	II, IV, V

	"The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American."			
5	Consider a modified version of the vacuum environment is given below in the figure 1, in which the agent is penalized one point for each movement.	**7**	CO-3	I
	 Figure 1. Vacuum world problem			
(a)	Can a simple reflex agent be perfectly rational for this environment? Explain.			
(b)	What about a reflex agent with state? Design such an agent.			
(c)	How do your answers to **a** and **b** (in above) change if the agent's percepts give it the clean/dirty status of every square in the environment?			
6	Suppose that, we are looking at a map of Australia showing each of its states and territories as shown below in the figure 2. We are given the task of coloring each region either red, green, or blue in such a way that no neighboring regions have the same color. Formulate this as a Constraint Satisfaction Problem (CSP) with the representation of constraint graph.	**5**	CO-3	III
	 Figure 2. The principal states and territories of Australia			
	OR			
7	Define the Bayes theorem and apply the Bayes'rule for examining the simple case and combining evidence with suitable examples.	**5**	CO-5	V