Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3161608 Date:16-12-2022

Subject Name:Artificial Intelligence

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Discuss various areas where Artificial Intelligence is used.	**03**
	(b)	Explain different issues in designing of search problems.	**04**
	(c)	What are the AI problem characteristics? Discuss in detail with example.	**07**
Q.2	**(a)**	Differentiate Generate and test algorithm with Best First Search algorithm.	**03**
	(b)	Solve and suggest the appropriate strategy for the following water-jug problem. You are given two jugs of capacity having 8 liters and 5 liters. There are no measuring markers on jugs. You have to obtain exact 4 liters of water into 8 liters jug.	**04**
	(c)	What is Hill Climbing algorithm? Discuss the cases where Hill climbing fails.	**07**

OR

	(c)	Consider the following initial and goal state configuration of 8-puzzle problem. Apply A* algorithm to reach from initial state to goal state by drawing search tree and show the solution. Consider number of misplaced tiles as a heuristic function.	**07**

Initial State

2	8	3
1	6	4
7		5

Goal State

1	2	3
8		4
7	6	5

Q.3	**(a)**	Describe following facts into predicate logic form. 1. Every child loves Santa. 2. Everyone who loves Santa loves any reindeer. 3. Rudolph is a reindeer, and Rudolph has a red nose.	**03**
	(b)	Convert the logical statement $P \Leftrightarrow (Q\ V\ R)$ to conjunctive normal form.	**04**
	(c)	Translate following sentences to predicate logic and prove that John likes peanuts using backward chaining. 1. John like all kinds of food. 2. Apples are food. 3. Chicken is food. 4. Anything anyone eats and isn't killed by is food. 5. Bill eats peanuts and is still alive. 6. Sue eats everything Bill eats	**07**

OR

Q.3	**(a)**	Differentiate propositional logic and predicate logic.	**03**

(b) Explain the Modus Ponens inference rule with example. **04**

(c) Translate following sentences to predicate logic and prove that "West is criminal" using resolution. **07**

1. It is a crime for an American to sell weapons to hostile nations.
2. All the missiles were sold to Nono by West.
3. The country Nono is an enemy of America.
4. An enemy of America counts as hostile.
5. Nono has some missiles.
6. Missiles are weapons.
7. West is an American.

Q.4 **(a)** Perform the unification of following atomic sentences. (i.e. Find the most general unifier.) **03**

1. Knows(John, x); Knows(y, Mother(y))
2. Q(a, g(x, a), f(y)), Q(a, g(f(b), a), x)

(b) What is goal stack planning? Give example of initial state and goal state in goal stack planning using some predicates. **04**

(c) What is wampus world? Explain in detail. **07**

OR

Q.4 **(a)** Perform the unification of atomic sentences. (i.e. Find the most general unifier.) **03**

1. p(b, X, f(g(Z))) and p(Z, f(Y), f(Y)).
2. test (11), test(y)

(b) Describe the axioms of probability theory. **04**

(c) Show the alpha-beta cutoff in min-max algorithm by drawing suitable game tree. **07**

Q.5 **(a)** Differentiate predicate and fact in Prolog programming. **03**

(b) Explain fail predicate in Prolog with example. **04**

(c) Write following Prolog programs: **07**

1. To copy one list to another list.
2. To check whether given number is odd or even.

OR

Q.5 **(a)** What will be the output of following Prolog program if program is called with test(10,2)? Also explain the reason of your output. **03**

```
test(X,Y):-write('Hello'),X>=Y,!.
test(X,Y):-write('Hi'),X<Y.
```

(b) What is maximum a posteriori (MAP) learning in Bayesian learning? Explain it. **04**

(c) Write following Prolog programs: **07**

1. To find the greatest variable among the three variables.
2. To count odd and even elements from a list.

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