Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 1720203 **Date: 31-12-2013**

Subject Name: Artificial Intelligence

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	(a)	Define the importance of state space representation. Explain and show the state space representation of the following problem. (i) 8 Puzzle (ii) Tower of Hanoi	07
	(b)	State key features of genetic algorithm. Explain in detail any one application which can be effectively solved using genetic algorithm.	07
Q.2	(a)	Explain forward chaining and backward using salesperson problem example.	07
	(b)	Prove that the set of states expanded by algorithm A^* is a subset of those examined by breadth-first search.	07
		---------- OR ---------- OR ----------	
	(b)	Prove that more informed heuristics develop the same or less of the search space.	07
Q.3	(a)	Define reasoning process. Explain the symbolic and statistical reasoning.	07
	(b)	Explain in detail expert system with its basic building blocks. Also state the advantages and characteristics of expert system.	07
		---------- OR ---------- OR ----------	
Q.3	(a)	Explain the Minimax search algorithm for the game of tic-tac-toe. Can we apply alpha-beta pruning strategy to improve search efficiency for this game? Justify your answer.	07
	(b)	Explain semantic nets. How it improves the knowledge representation.	07
Q.4	(a)	Develop graphically membership function to describe the linguistic variables "cold", "warm" and "hot" using trapezoidal, triangular and bell shaped membership functions. Consider the temperature range is 0°C to 100°C.	07
	(b)	Find the fuzzy *max-min* composition between two fuzzy relations $\tilde{R}$ and $\tilde{S}$ $\tilde{R}=\begin{bmatrix}0.60 & 0.25\\ 0.81 & 0.45\end{bmatrix}$ and $\tilde{S}=\begin{bmatrix}0.80 & 0.40 & 0.20\\ 0.10 & 0.60 & 0.10\end{bmatrix}$	07
		---------- OR ---------- OR ----------	
Q.4	(a)	Explain the various techniques for fuzzy to crisp conversions.	07

(b) Define the equivalence of fuzzy relation. Find whether the given fuzzy relation is equivalence or not 07

$$\tilde{R} = \begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$

Q.5 (a) What is Bias? State the need and advantages of bias. How does it improve the result? 07

(b) Explain the principle of Back Propagation. Derive the Back Propagation Algorithm for weight updation between the output layer and hidden layer. 07

---------- OR ---------- OR ----------

Q.5 (a) Draw the McCulloh Pitts model of a neuron and explain how it is used to perform AND and OR functions. 07

(b) Design a perceptron for the OR function having binary inputs and unipolar targets shown as 07

x_1	x_2	T
0	0	0
0	1	1
1	0	1
1	1	1

Consider the initial weights: $w_{01} = 0.1$ $w_{11} = 0.1$, $w_{21} = 0.2$, and the learning rate constant $\eta = 0.2$, threshold = 0.5.

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