Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)

Academic Year (2022-23)

Year: 3 Semester: V

Program: T.Y. Tech. (Computer Engg.)	**Max. Marks: 75**
Subject: Artificial Intelligenec	**Time: 10:30 am to 1:30 pm**
Date: 07/01/23	**Duration: 3 Hours**

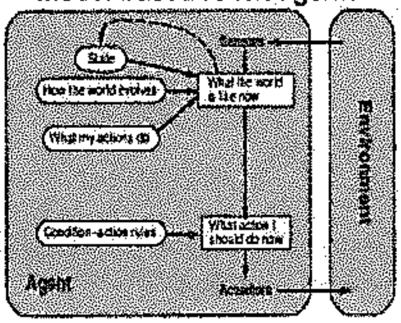
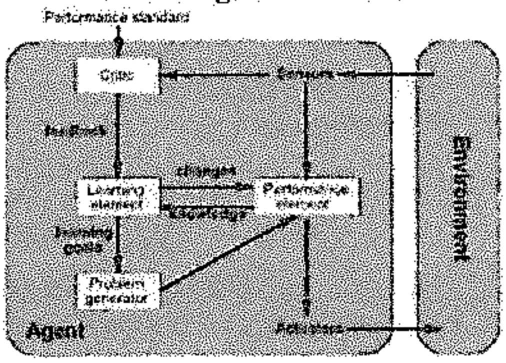
REGULAR EXAMINATION

ANSWER KEY (Set 1)

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains two pages.
(2) All Questions are Compulsory.
(3) All questions carry equal marks.
(4) Answer to each new question is to be started on a fresh page.
(5) Figures in the brackets on the right indicate full marks.
(6) Assume suitable data wherever required, but justify it.
(7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	PEAS for self-driving car 05 Marks • Performance: Safety, time, legal drive, comfort. • Environment: Roads, other cars, pedestrians, road signs. • Actuators: Steering, accelerator, brake, signal, horn. • Sensors: Camera, sonar, GPS, Speedometer, odometer, accelerometer, engine sensors, keyboard. **Justification of specified PEAS w.r.t. following points,** 05 Marks Fully observable vs Partially Observable Static vs Dynamic Discrete vs Continuous Deterministic vs Stochastic Single-agent vs Multi-agent Episodic vs sequential Known vs Unknown Accessible vs Inaccessible **OR**	[10]

	For each model: Explanation: 3 Marks and Diagram : 2 marks Model-based reflex agents   		[10]
Q1 (b)	Heuristic function : Properties : Admissible, Monotonic	02 Marks 03 Marks	[05]
Q2 (a)	**For both the options:** Explaination Working example Comment on performance	 05 Marks 04 Marks 01 Mark	[10]
Q2 (b)	**Steps: 1 Mark for each step** Initial population. Fitness function. Selection. Crossover. Mutation.		[05]
Q3 (a)	Universal and Existential quantifiers Unification example **OR** **FOL form:** 1. Every child loves every candy. $\forall x\ \forall y\ (CHILD(x) \wedge CANDY(y) \rightarrow LOVES(x,y))$ 2. Anyone who loves some candy is not a nutrition fanatic. $\forall x\ (\ (\exists y\ (CANDY(y) \wedge LOVES(x,y))) \rightarrow \neg\ FANATIC(x))$ 3. Anyone who eats any pumpkin is a nutrition fanatic. $\forall x\ ((\exists y\ (PUMPKIN(y) \wedge EAT(x,y))) \rightarrow FANATIC(x))$ 4. Anyone who buys any pumpkin either carves it or eats it. $\forall x\ \forall y\ (PUMPKIN(y) \wedge BUY(x,y) \rightarrow CARVE(x,y) \vee EAT(x,y))$ 5. John buys a pumpkin. $\exists x\ (PUMPKIN(x) \wedge BUY(John,x))$ 6. Lifesavers is a candy. $CANDY(Lifesavers)$ 7. (Conclusion) If John is a child, then John carves some pumpkin. $CHILD(John) \rightarrow \exists x\ (PUMPKIN(x) \wedge CARVE(John,x))$ **CNF form:**	04 Marks 06 Marks 05 Marks 05 Marks	[10] [10]

Q3 (b) [05]

Backward chaining	Forward chaining
Goal driven approach.	Data driven approach.
Backward chaining is a reasoning technique employed by the expert.	Forward chaining is problem solving technique used by Expert System (ES).
Approach starts with an expectation of what's happening and evidence that supports the expectation.	Approach starts with basic available data, then later draws conclusion.
Analyzes by testing hypotheses and sub hypotheses.	Analyzes the problem making use of inference rules.
Backward chaining tends to ask less data and examine more rules.	Forward chaining tend to ask more data to eliminate possibilities and therefore to process fewer rules.
Good for problem diagnosis.	Good for configuring computer system and to meet their requirements.
Backward chaining runs more efficiently than forward chaining.	It's not so efficient compared to backward chaining.

Q4 (a) [10] [10]

For both the options:

Planning description — 05 Marks
Example — 05 Marks

Q4 (b) [05]

The operations of fuzzy sets A and B are listed as follows.

Union:

$$A \cup B \Leftrightarrow \mu_{A \cup B} = \mu_A \vee \mu_B.$$

Intersection:

$$A \cap B \Leftrightarrow \mu_{A \cap B} = \mu_A \wedge \mu_B.$$

Complement:

$$\bar{A} \Leftrightarrow \mu_{\bar{A}} = 1 - \mu_A.$$

Algebraic Product:

$$A \cdot B \Leftrightarrow \mu_{A \cdot B} = \mu_A \mu_B.$$

Algebraic Sum:

$$A \dot{+} B \Leftrightarrow \mu_{A \dot{+} B} = \mu_A + \mu_B - \mu_A \mu_B = 1 - (1 - \mu_A)(1 - \mu_B).$$

643/48/1-3

32 MIZUMOTO AND TANAKA

Bounded-Sum:

$$A \oplus B \Leftrightarrow \mu_{A \oplus B} = 1 \wedge (\mu_A + \mu_B).$$

Bounded-Difference:

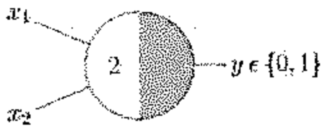
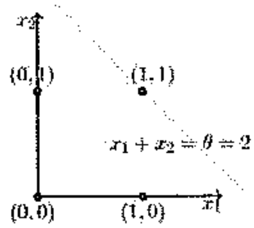
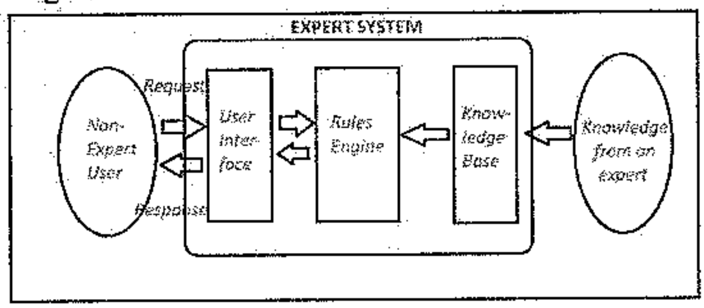
$$A \ominus B \Leftrightarrow \mu_{A \ominus B} = 0 \vee (\mu_A - \mu_B).$$

Bounded-Product:

$$A \odot B \Leftrightarrow \mu_{A \odot B} = 0 \vee (\mu_A + \mu_B - 1),$$

Q5 (a) [10]

Linear separability — 04 Marks
AND Gate designing — 06 Marks

	Truth Table, Weights, Theta parameters  *AND function* $x_1 + x_2 = \sum_{i=1}^{2} x_i \geq 2$  **OR** Feed Forward Network Theory Diagram/Flowchart/Algorithm	 05 Marks 05 Marks	[10]
Q5 (b)	Explanation Diagram  	03 Marks 02 Marks	[05]

All the Best!