

Name :

Roll No. :

Invigilator's Signature :

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2012

ARTIFICIAL INTELLIGENCE

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

i) Associative network is based on

- a) Quillian's Model
- b) Connection's Model
- c) Dempster Shafer's Model
- d) Winograd Model.

ii) McCulloch Model uses

- a) Sigmoid Function
- b) Step Function
- c) Signum Function
- d) Tan hyperbolic Function.

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- iii) The resolution of the two clauses : $\neg LAST(Y, Z) \vee LAST(\text{cons}(X, Y), Z)$ and $\neg LAST(\text{cons}(2, \text{cons}(1, NIL)), V)$ yields
- a) $LAST(\text{cons}(1, Nil), V) \wedge LAST(\text{cons}(X, Y), Z)$
 - b) $LAST(\text{cons}(1, Nil), V)$
 - c) $\neg LAST(\text{cons}(1, Nil), V)$
 - d) $\neg LAST(Y, Z) \vee LAST(\text{cons}(X, Y), Z)$
- iv) The three valid objects in *LISP* are
- a) Atom, integer, string
 - b) Atom, character, string
 - c) Integer, character, string
 - d) Atom, lists and string.
- v) Inductive learning involves the process of
- a) Class formation
 - b) Cluster formation
 - c) Concept development
 - d) Both class and cluster formation.
- vi) The first expert system developed by Stanford University was
- a) MYCIN
 - b) DENDRAL
 - c) EMYCIN
 - d) PROSPECTOR.

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vii) The odds-likelihood form of Bayes' Rule is written as

- a) $O(H | E) = L(H | E) \cdot O(H)$
- b) $O(E | H) = L(E | H) \cdot O(H)$
- c) $O(H | E) = L(E | H) \cdot O(H)$
- d) $O(H | E) = L(E | H) \cdot O(E).$

viii) "All employees of the AI-Software Company are programmers" is written in FOPL as

- a) $(\text{AI-Software-co-employees } X) \rightarrow \text{Programmers } (X)$
- b) $(\exists X) (\text{AI-Software-co-employees } (X) \rightarrow \text{Programmers } (X))$
- c) $(\forall X) (\text{AI-Software-c -employees } (X) \wedge \text{Programmers } (X))$
- d) $(\forall X) (\text{AI-Software-co-employees } (X) \rightarrow \text{Programmers } (X)).$

ix) Let A_1 and A_2 be admissible algorithms with heuristic estimation functions h_1^* and h_2^* , respectively. A_1 is said to be more informed than A_2 whenever

- a) $h_1^*(n) > h_2^*(n)$ for all n
- b) $h_1^*(n) > h_2^*(n)$ for at least one n
- c) $h_1^*(n) \leq h_2^*(n)$ for all n
- d) $h_1^*(n) \leq h_2^*(n)$ for all n .

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- x) The main job of Truth Maintenance System is to maintain
 - a) Consistency of the knowledge being used by the problem solver as well as to perform all inference functions
 - b) Consistency of the knowledge being used by the problem solver and not to perform any inference functions
 - c) Consistency of the knowledge being used by the problem solver as well as to perform some inference functions
 - d) Both (a) and (c).

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

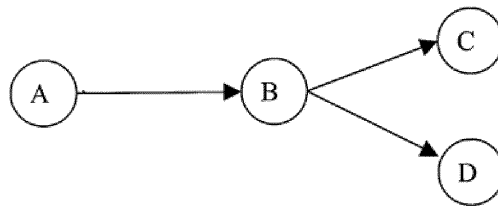
- 2. Give the semantic representation of the following sentences :
 - i) Mouse is a rodent, rodent is a mammal that has hairs and drinks milk.
 - ii) Every woman loves every children.
- 3. How will the LISP interpreter evaluate the following expressions ? Show how will the results get affected with and without the quotation marks ?
 - i) (cons '(× 3 5)'(3))
 - ii) (cons (× 3 5)'(3))

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4. State the fundamental steps of Genetic Algorithm (GA).
5. Draw the entire game tree for the NIM game. Point the path through which the first player always wins using MINMAX algorithm. (The NIM game runs as follows, there are odd number of sticks (say 7). Two players a MINIMIZER and a MAXIMIZER play the game. MINIMIZER starts the game. The players have to divide a group of sticks into two groups such that no two groups can have same number of sticks. The player who cannot divide a group into two is the loser
6. What is production system ? Explain Conflict resolution strategies.

GROUP – C**(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7. a) Consider the belief network shown in the following figure A,B,C and are Boolean variables. The conditional probability tables involving these variables are given below.



$$P(A) = 2/3, P(B/A) = \frac{1}{2}, P(B/\neg A) = \frac{1}{4}, P(C/B) = 4/5,$$

$$P(C/\neg B) = 1/5, P(D/B) = 5/6, P(D/\neg B) = 1/3$$

- i) Compute $P(A/B)$ in terms of the given probability values.
- ii) Compute $P(C/A)$.

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- b) What is the difference between CLASSICAL MODUS PONENS and FUZZY MODUS PONENS ? Explain with examples. 9 + 6

8. a) Convert the following expression into clausal form :

$$\forall X \text{ Man } (X) \wedge \forall Y (\text{Child } (Y) \vee \text{Woman } (Y)) \rightarrow \neg \text{Dislikes } (X, Y)$$

- b) Given the following predicate Logic statements :

i) $\forall X ((\text{Bird } (X) \vee \text{Bat } (X)) \rightarrow \text{Fly } (X))$

ii) $\forall X (\text{Has-feather } (X) \wedge \text{Belongs-to-Avis-class } (X) \rightarrow \text{Bird } (X))$

iii) $\text{Has-feather } (\text{parrot})$

iv) $\text{Belongs-to Avis-calss } (\text{parrot})$

Prove by resolution the $\text{Fly } (\text{parrot})$ follows from the statements (i) through (iv) 6 + 9

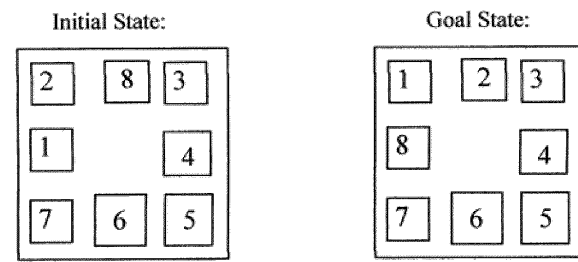
9. Using the Cryptarithmic Algorithm solve the following problem :

$$\text{CROSS} + \text{ROADS} = \text{DANGER}$$

10. a) What is the basic difference between a Production System Architecture and a non-Production System Architecture ? Explain your answer with examples.
- b) Explain the Blackboard System architecture.
- c) What is learning by Induction ? 5 + 7 + 3

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11. a) What is Hill Climbing ? What are its pitfalls ?
- b) Solve the following 8-puzzle problem using Hill climbing approach :



5 + 10