

This question paper contains 3 printed pages.

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Your Roll No.

MECTA

J

COMPUTER TECHNOLOGY AND APPLICATIONS

Paper – CS . 602

(Artificial Intelligence)

Time : 3 hours

Maximum Marks : 100

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt total five questions. Question No. 1 is compulsory.

- 1 (a) Suppose that we are attempting to resolve the following clauses: 4
loves(father(a), a) and \sim loves(y, x) \vee loves(x, y)
What will be the result of the unification algorithm when applied to clause1 and the first term of clause2? What must be generated as a result of resolving these two clauses?
- 1 (b) Under what conditions, A* algorithm gives an optimal solution? 4
- 1 (c) Draw semantic network of the following sentence 4
John is taller than Bill.
- 1 (d) Given $CF(h, O_1) = 0.5$, $CF(h, O_2) = 0.3$. Find $CF(h, O_1 \wedge O_2)$. 4
- 1(e) Define Expert System and write major components of Expert System. 4
- 1 (f) A neuron j receives inputs from two neurons whose activity levels are 0.6 and 0.5. The respective synaptic weights of j are -0.2 , 0.8 and the bias is 0.02 . Calculate the output of the neuron if the neuron uses the sigmoid function as the activation function. 4
- 1 (g) How are fuzzy membership values different from probabilities? 4
- 2 (a) Consider the following problem: 10
A farmer wants to transfer his belongings, a wolf, a goat and a cabbage, by a boat from the left bank of a river to its right bank. The goat can carry at most two items including the farmer. If unattended, the wolf may eat up the goat and the goat may eat up the cabbage. How should the farmer plan

Turn over

to transfer the items? List the production rules and show the state space diagram to solve the problem.

- 2 (b) Prove that a less informed admissible heuristic expands at least as much of the search space as a more informed admissible heuristic. 8
- 3(a) Consider the following knowledge base: 10
 The humidity is high and the sky is cloudy.
 If the sky is cloudy then it will rain.
 If the humidity is high then it is hot.
 It is not hot.
 And the goal: It will rain.
 Prove by resolution theorem that the goal is derivable from the knowledge base.
- 3 (b) Explain that Bayesian statistics provide a good basis for reasoning under uncertainty. 8
- 4 (a) Explain Bidirectional Associative Memory. Write algorithm to remove the noise in a signal vector. 10
- 4(b) Let A and B be two fuzzy sets given by 8
 $A = \{x_1, 0.2\}, \{x_2, 0.5\}, \{x_3, 0.6\}$
 $B = \{x_1, 0.1\}, \{x_2, 0.4\}, \{x_3, 0.5\}$
 Find $(A-B)^2$
- 5 (a) Explain with example the If_needed and If_added procedures attached to a slot in frames. 8
- 5 (b) The game nim is played as follows: Two players alternate in removing one, two or three pennies from a stack initially containing five pennies. The player who picks up the last penny loses. Show by drawing the game graph that the player who has the second move can always win. 10
- 6 (a) Write a PROLOG program to determine if a list M is a sub list of a list N. 10
 A list M is a sub list of N iff the sequence of elements in M is a contiguous subsequence of N.
- 6 (b) If a problem-solving search program were to be written to solve each of the following types of problems, determine whether the search should proceed forward or backward: 8
 (i) water jug problem
 (ii) blocks world

- 7 (a) Express the following sentence in predicate logic format and then clause form 6
"There is no car as good as a Mercedes"
- 7 (b) Show how means-ends analysis could be used to solve the problem of getting from one place to another. Assume that the available operators are walk, drive, take the bus, take a cab and fly. 8
- 7 (c) Explain the belief interval in Dempster-Shafer theory. 4