

Total number of printed pages-5

53 (IT 715) ARIN

2019

ARTIFICIAL INTELLIGENCE

Paper : IT 715

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) Define the perception and action cycle and how agent perceives the action in grid space world. 5
- (b) What is DFS ? What are the merits and demerits of DFS ? 5



Contd.

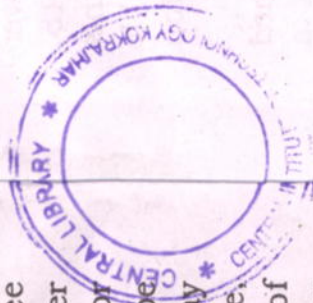
(c) Three missionaries (M) and three cannibals (C) are on one side of a river along with a boat that can hold one or two people. Missionaries must never be outnumbered by cannibals. Find a way to get everyone to the other side, without ever leaving a group of missionaries outnumbered by cannibals. Give a plan for all to cross the river. State : $\langle M, C, B \rangle$

- M: No. of missionaries on the left bank, • C: No. of cannibals on the left bank, • B: position of the boat (One side of river) : L or R,

Initial state : $\langle 3, 3, L \rangle$,
 Goal state : $\langle 0, 0, R \rangle$,
 Operators : $\langle M, C \rangle$, M & C represent No. of missionaries and cannibals on the boat respectively. Valid operators : $\langle 1, 0 \rangle \langle 2, 0 \rangle, \langle 1, 1 \rangle \langle 0, 1 \rangle \langle 0, 2 \rangle$.

10

2. (a) What is the role of decision tree in state-space graph? How can increase the efficiency of decision tree? 4



(b) The heuristic path algorithm is a best first search in which the objective function is $f(n) = (3 - w)g(n) + 2w*h(n)$. For what values of w is this algorithm guaranteed to be optimal? (You assume that h is admissible.) What if $w = 0$? And When $w = 3$?

(c) Explain A* algorithm for solving 8-puzzle problem.

3. (a) What is the role of monotone heuristic in A* algorithm? How can check update the heuristic value of successor according this condition? Write down the conditions for check heuristic and updating same. What function will denote the inadmissible condition for A* algorithm?

(b) What is the role of OPEN and CLOSED in uninformed search (US) algorithm (searching with cost)? Can be algorithm visit the particular CLOSED node, after reaching on the goal in the algorithm?

(c) Write down the steps of A* algorithm which estimate the cost of goal.

4. (a) Maximize the function $f(x) = x^3 + 5$ over the range of integers from 0...15. Apply a genetic algorithm to solve this problem. Show at least the possible solution (i.e. near to termination criteria).

(Note : x represents five-digit unsigned binary integers, $f(x)$ value itself a fitness solution, Coding in binary form having 3-bit string length (represent 8 numbers, Four chromosomes (1011, 0101, 1001, 0011) as initial populations, Decode individual for further evaluation (like fitness i.e. $(0101 = 5; 5^3 + 5 = 125 + 5 = 130)$, probability, random number, crossover and mutation). 10

(b) Explain alpha-beta (α - β) pruning algorithm. 10

5. (a) What is Knowledge representation? Explain propositional and predicate calculus with examples. 10

(b) Write down Genetic algorithm and explain Genetic algorithm cycle of reproduction. 10

6. Write short notes on the following :
(any four) 4x5=20

(a) Conjunctive Normal Form (CNF)

(b) Generalized Modus Ponens (GMP)

(c) STRIPS

(d) Iterative Deepening (ID)

(e) Universal and Existential Quantifier.

