53 (CS 711) ARIN

2019

ARTIFICIAL INTELLIGENCE

Paper : CS 711

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. 6

   (b) What is the role of connectives in the propositional logic ? And explain the two sentences based on these connectives. 4

   (c) Explain the state space search method with the decision tree approach and also explain the role of backtracking in decision tree with example. 5

Contd.

(d) Write down the steps of Hill climbing search. 5

2. (a) Write down the steps of greedy search algorithm. 8

(b) Find the shortest path from the starting state 'S' to the goal 'G' The graph is shown below in the *Figure* (1). Apply the Uninformed search. List the nodes, after expanding and add to the extended list, in order. Distances are shown next to edges. 12

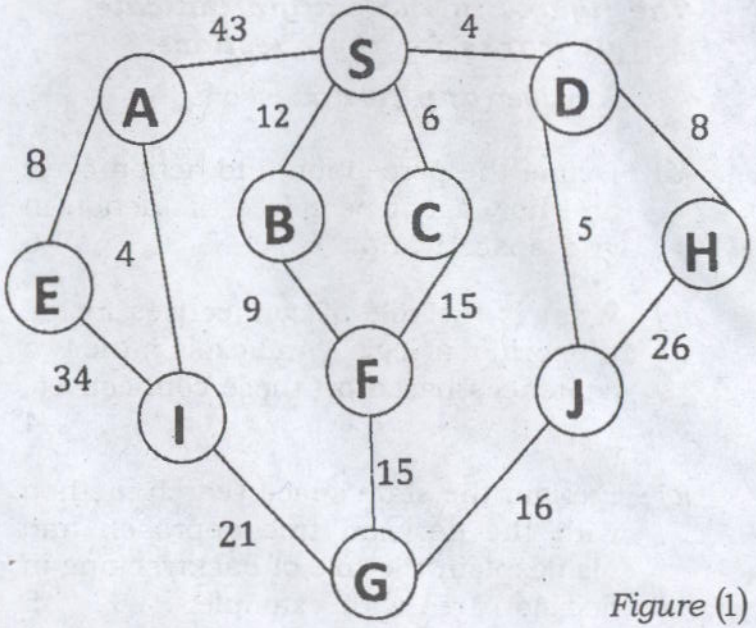


Figure (1)

3. (a) Explain the production system and also the production system for agent boundary using Boolean notation.

(b) What was the need of Turing test ?

(c) What kind of problems identified during Turing test ?

(d) Draw *four* features of agent's perception in grid-space world and write down the set of rules for agent's action. 5+3+4+8=20

4. (a) What is the role of decision tree in state-space graph ? How can increase the efficiency of decision tree ? 5

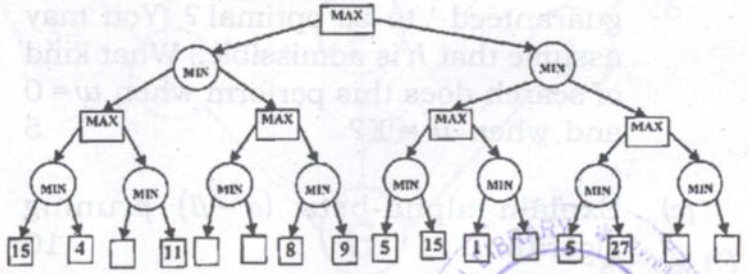
(b) The heuristic path algorithm is a best-first search in which the objective function is $f(n) = (2-w)*g(n) + w*h(n)$. For what values of w is this algorithm guaranteed ' to be optimal ? (You may assume that h is admissible.) What kind of search does this perform when $w = 0$ and when $w = 1$? 5

(c) Explain alpha-beta $(\alpha - \beta)$ pruning algorithm. 10

5. *(a)* Maximize the function $f(x) = x^3 + x^2 + 2$ over the range of integers from 0...7. 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 (101, 101, 011, 001) as initial populations, Decode individual for further evaluation (like fitness *i.e.* $(101 = 5; 5^3 + 5^2 + 2 = 125 + 25 + 2 = 152)$, probability, random number, crossover and mutation). 10

(b) Apply this algorithm to find out the MAX (α-value) in the given figure below. Mention the $\alpha - \beta$ values also in the evaluation of MAX (Root). 10



6. Write short notes on the following : ***(any four)*** 4×5=20

(a) Propositional calculus

(b) Local search algorithm

(c) Artificial Neural Network

(d) STRIPS

(e) Iterative Deepening A*.