JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2023

M. Tech-I Semester (CSE/IT/DS)

COURSE CODE (CREDITS): 22M1WCI132 (3) MAX. MARKS: 25

COURSE NAME: Artificial Intelligence Techniques

COURSE INSTRUCTORS: Dr. Nancy Singla MAX. TIME: 1 Hour 30 Minutes

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Note: *(a) All questions are compulsory.*
(b) Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

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Q1. Consider a genetic algorithm in which individuals are represented using a 5-bit string of the form b1b2b3b4b5. An example of an individual is 001001 for which b1=0, b2=0, b3=1, b4=0, b5=1. [2+2+2] CO1

The fitness function is defined over these individuals as follows:
f(b1b2b3b4b5) = b1 + b2 + b3 + b4 + b5 + AND(b1,b2,b3,b4,b5)

(a) Calculate the fitness and probability of selection of the following individuals in the population.
00101, 11101, 00000, 10010, 11111

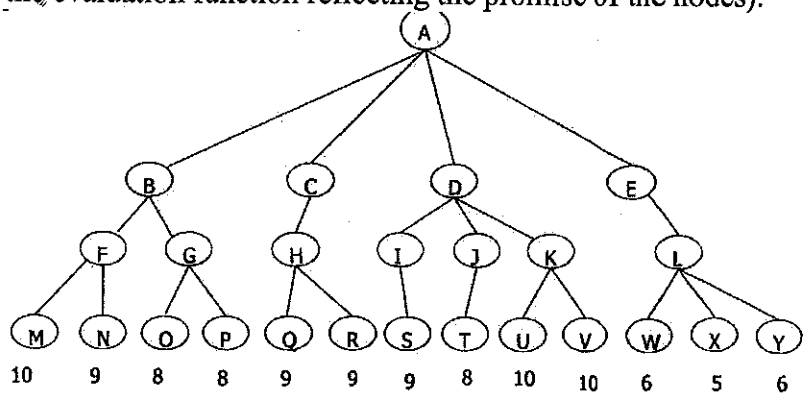
(b) Suppose that a single crossover point will be used for crossover. This point has been chosen as the point between the 2nd and the 3rd bits (i.e. between b2 and b3). Show the two offspring that will result from crossing over the following two individuals:
00101, 10111

(c) Explain how the standard mutation method is applied after selection and crossover to form the "next" generation of a population.

Q2. (a) Describe simulated annealing search algorithm. [2+2] CO1

(b) How would simulated annealing work if the temperature T is always fixed at zero?

Q3. Consider the following hypothetical game tree (the values at the leaves are values of the evaluation function reflecting the promise of the nodes): [3+3] CO1

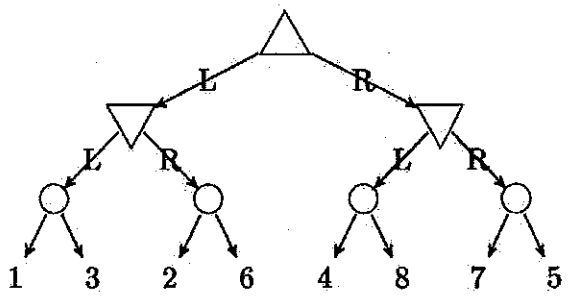


(a) Using minimax technique, obtain the value at the root and show which move player A should make.

(b) Apply Alpha-Beta pruning from left to right and show which parts of the tree need not be generated.

Q4. (a) How can randomness be incorporated into a game tree? [2+2]

(b) Consider a game with eight cards (c ∈ {1, 2, 3, 4, 5, 6, 7, 8}), sorted onto the table in four stacks of two cards each. MAX and MIN each know the contents of each stack, but they do not know which card is on top. The game proceeds as follows. First, MAX chooses either the left or the right pair of stacks. Second, MIN chooses either the left or the right stack, within the pair that MAX chose. Finally, the top card is revealed. MAX receives the face value of the card (c), and MIN receives 9 − c. The resulting expectiminimax tree is as follows: CO1



Assume that the two cards in each stack are equally likely. What is the value of the top MAX node?

Q5. (a) Write a function for a generic knowledge-based agent that returns an action for a given percept. [3+2] CO3

(b) What are the steps followed in the forward chaining mode of the inference engine used in an intelligent system?