

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Midterm
Duration: 1 Hour 10 Minutes

Semester: Fall 2022
Full Marks: 40

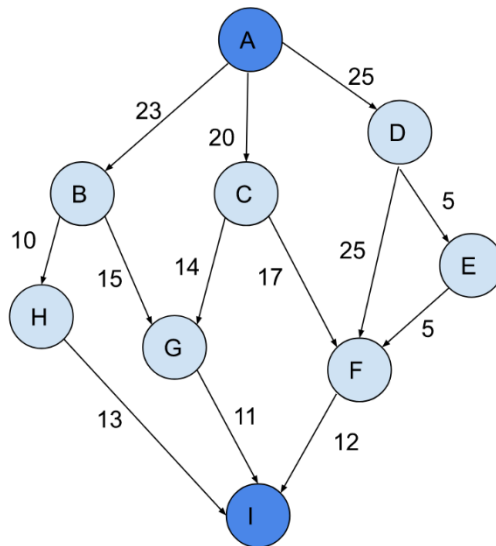
CSE 422: Artificial Intelligence

Answer 4 out of 5 from the following questions
Figures in the right margin indicate marks

Name:	ID:	Section:
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1. CO1 a. Assume you have tried to design an AI agent. Now suppose, when making a decision, your agent doesn't utilize the continuous percepts that it receives from the environment and only relies on the domain knowledge that you had provided to it initially. **Identify** the property of an Intelligent agent your agent lacks. 2
- b. **Identify** which of the following statements are true or false. Provide reasons behind your answers: (i) An AI based Chess game is an example of a Dynamic Environment; (ii) A simple reflex agent relies on its percept sequence; (iii) For an agent to be rational, it first needs to be Intelligent. 6
- c. **Bullet Point** two advantages that a Utility based agent can have over a Goal based agent. 2

2. CO2 In the following graph, A is the source and I is the destination. Each edge has a cost associated with it.

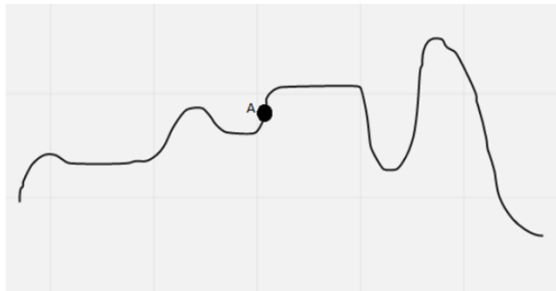


- a. For each of the nodes from A to I in the graph above, **define** a random heuristic value that is consistent. 10
3. CO2 Assume [X1, X2, X3, X4, X5, X6, X7, X8] represents a set of 8 numbers where each number can be anything from 1 to 100. Now your task is to find such a set with a combination of numbers where the difference between sum of the even numbers and sum of the odd numbers is 30. And you have to solve this problem using Genetic Algorithm. So, for e.g., if D1 represents sum of the

odd numbers and D2 represents sum of the even numbers then $(D1 - D2)$ or $(D2 - D1)$ will be equal to 30 for the solution.

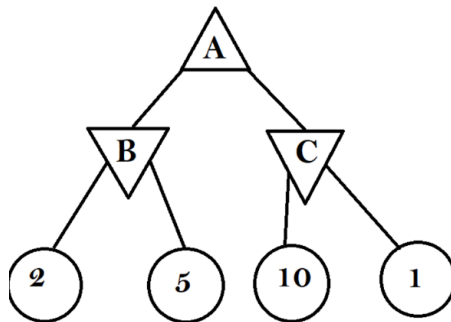
- a. Encode the problem and **deduce** two parent chromosomes, PC1 and PC2. But for PC1, the value of X1 should be 100, and for PC2 the value of X1 should be 1. 2
- b. **Define** a suitable fitness function for the problem and calculate the fitness of PC1 and PC2. 5
- c. **Illustrate** single point crossover after X4 between PC1 and PC2, and then perform mutation. You can mutate a number of your choosing. Finally, calculate fitness of the two newly formed child chromosomes and comment on which child is fitter. 3

4. CO2



- a. What kind of problem a hill climb search might face if it starts at point A? **Explain.** 3
- b. Apart from the problem given in question a, can you suggest any other problems that might occur? Discuss in **details.** 4
- c. **Explain** the main advantage of simulated annealing algorithm over regular hill climb algorithm. 3

5. CO4



- a. If you run minimax algorithm on this adversarial search tree, what would be the values at nodes A, B, and C? **Show** your entire process. 3
- b. **Define** the values of α and β at nodes A, B, and C if you ran alpha-beta pruning here? 3
- c. **Analyze** the game tree and sort the leaf nodes in a way so that the edge from A to C is pruned if you ran alpha-beta pruning. Give the values of α and β at nodes A, B, and C. 4