Department of Computer Science & AI
College of Computer Science & Engineering
UNIVERSITY OF JEDDAH, KSA

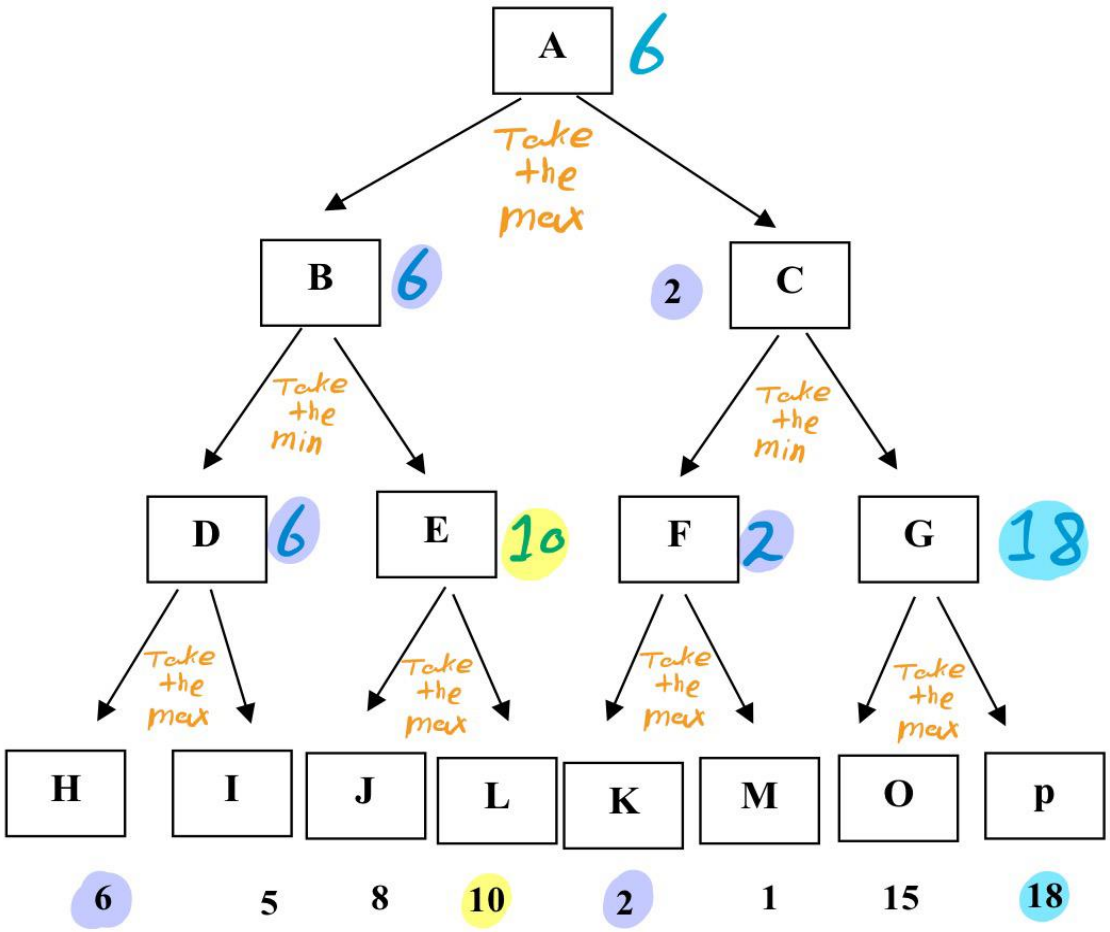
Assignment 2

Course Title:	Fundamentals of AI	**Course Code:**	CCAI-221
Weightage:	5%	**Due Date**	Thursday 9-Feb-2023
Remarks:	The submission is online, and system will not allow submission after due date.		

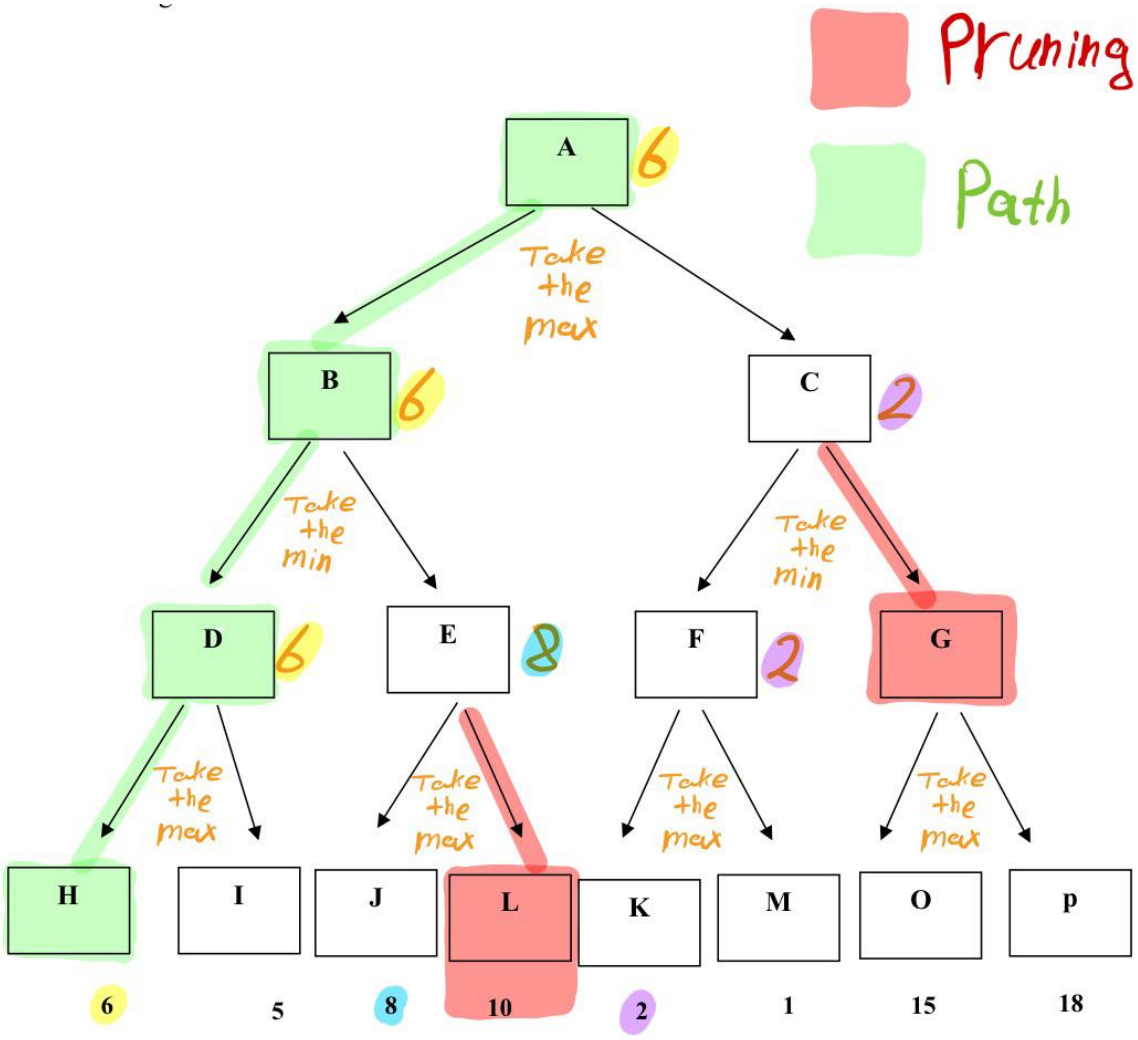
Student name: Khalid Nimri **Student ID:**

Question 1: (2 marks)

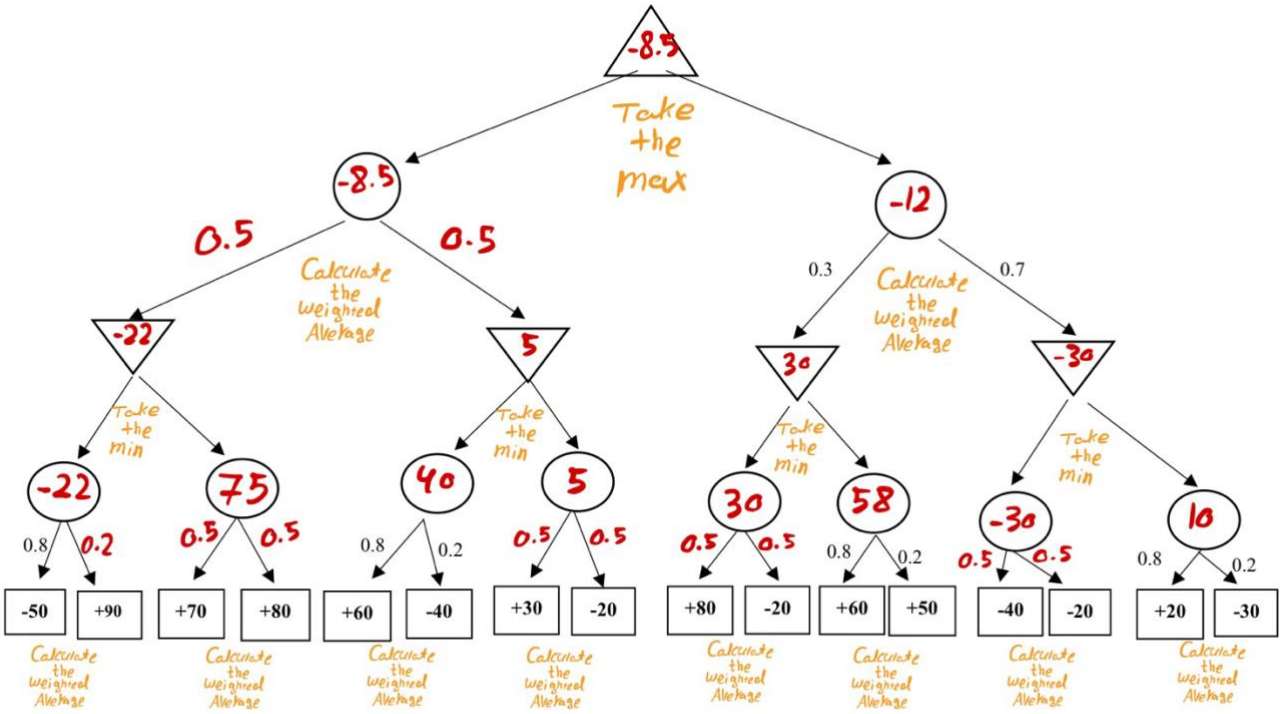
A) Given the following search tree, apply the Minmax algorithm to it and show the search tree that would be built by this algorithm.



B) Apply the alpha-beta pruning algorithm to it and show the search tree that would be built by this algorithm



C) Given the following search tree, apply the Expected Minmax algorithm to it and show the search tree that would be built by this algorithm.



Question 2: (3 marks)

You are in charge of scheduling for computer science classes that meet weekly. There are 5 classes that meet and 3 professors who will be teaching these classes. You are constrained by the fact that each professor can only teach one class at a time.

The classes are:

1. Class 1 - Intro to Programming: meets from 8:00-9:00am
2. Class 2 - Intro to Artificial Intelligence: meets from 8:30-9:30am
3. Class 3 - Natural Language Processing: meets from 9:00-10:00am
4. Class 4 - Computer Vision: meets from 9:00-10:00am
5. Class 5 - Machine Learning: meets from 10:30-11:30am

The professors are:

1. Professor A, who is qualified to teach Classes 1, 2, and 5.
2. Professor B, who is qualified to teach Classes 3, 4, and 5.
3. Professor C, who is qualified to teach Classes 1, 3, and 4.

I. Formulate this problem as a CSP problem.

a. State the domain

C1 {A,C}
C2 {A}
C3 {B, C}
C4 {B, C}
C5 {A, B}

b. State the variables

C1
C2
C3
C4
C5

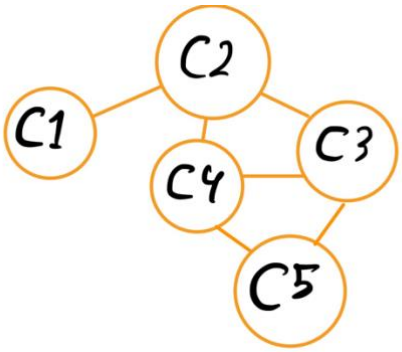
c. Unary constraints

C1 {A,C}
C2 {A}
C3 {B, C}
C4 {B, C}
C5 {A, B}

d. Binary constraints

C1 ≠ C2
C2 ≠ C3
C2 ≠ C4
C3 ≠ C4

I. Draw the constraint graph associated with your CSP



II. What are the domains of the variables after enforcing node-consistency?

C1 {C}
C2 {B}
C3 {C}
C4 {A}
C5 {B}

III. What are the domains of the variables after enforcing arc-consistency?

C1 {C}
C2 {B}
C3 {A, C}
C4 {A, C}
C5 {B, C}

Train your Brain:

Five men with different nationalities and with different jobs live in consecutive houses on a street. The houses are painted different colors. The men have different pets and have different favorite drinks. Determine who owns a zebra and whose favorite drink is mineral water (which is one of the favorite drinks) given these clues:

1. The Englishman lives in the red house.
2. The Spaniard owns a dog.
3. The Japanese man is a painter.
4. The Italian drinks tea.
5. The Norwegian lives in the first house on the left.
6. The green house is on the right of the white one.
7. The photographer breeds snails.
8. The diplomat lives in the yellow house.
9. Milk is drunk in the middle house.
10. The owner of the green house drinks coffee.
11. The Norwegian's house is next to the blue one.
12. The violinist drinks orange juice.
13. The fox is in a house next to that of the physician.
14. The horse is in a house next to that of the diplomat.

Hint: Make a table where the rows represent the men and columns represent the colors of their houses, their jobs, their pets, and their favorite drinks and use logical reasoning to determine the correct entries in the table.

This is a fun puzzle to think about. However, it has to do with "logic" only marginally. The real difficulty is in knowing where to start, and in how to think about the problem.

When addressing real-life problems as computer scientists, we will be in this situation often: someone poses a problem (usually less well defined than this one), and we are asked to solve it. This is different from solving a homework assignment in a class. For the homework, we are either told what technique to apply, or we can make an educated guess by picking a solution method from the part of the textbook that the problem refers to. In real life, all we have is the problem itself, and whatever knowledge and experience we have accumulated over time. So how do we come up with a solution? We will use the zebra puzzle to explore some heuristics for thinking about complex problems.

Try to solve the above problem in a group of 5-8 students (please write you group names and IDs), you may deal with it as a CSP problem, define the variables and domains, maybe identify the constraints, you may use Backtracking algorithm, with some improvements/heuristics like MRV, degree heuristics and so on, you may use forward checking/ arc-consistency, **OR THINK OF A MORE SUITABLE LOGICAL WAY TO SOLVE IT.** It is up to you to choose a suitable and clear methodology that you have learned to solve it.