BINUS University

Academic Career: ***Undergraduate / ~~Master~~ / ~~Doctoral~~ *)***		**Class Program:** ***International/Regular/~~Smart Program~~/~~Global Class~~*)***	
☑ Mid Exam **☐ Final Exam** **☐ Short Term Exam** **☐ Others Exam : _____**		**Term : ~~Odd~~/Even/~~Short~~ *)**	
☑ Kemanggisan **☑ Alam Sutera** **☑ Bekasi** **☐ Senayan** **☐ Bandung** **☐ Malang**		**Academic Year :** **2021/2022**	
Faculty / Dept. : School of Computer Science		Deadline	Day / Date : Thursday/ Apr 28th, 2022 Time : 17:00
Code - Course : COMP6065 - Artificial Intelligence		Class : All Classes	
Lecturer : Team		Exam Type : Online	
*) *Strikethrough the unnecessary items*			
The penalty for CHEATING is DROP OUT!!!			

Learning Outcomes:

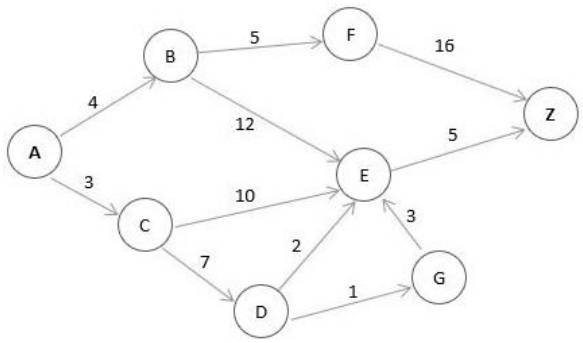
LO 1 : Describe what is AI and identify concept of intelligent agent
LO 2 : Explain various intelligent search algorithms to solve the problems
LO 3 : Explain how to use knowledge representation in reasoning purpose
LO 4 : Apply various techniques to an agent when acting under certainty

I. Essay (40%)

1. **[LO 1, 20 points]** On the preliminary discussion on AI, we learn about Agents. Please provide in detail with types of Agents as well as with real examples on for each of those Agents!
2. **[LO 1, LO 3, 20 points]** Please provide in detail with the implementation of uncertainty reasoning as well with the mathematical formulation!

II. Case (60%)

1. **[LO 2, 20 points]** Using A* Search Algorithm, what is the shortest path to travel from A to Z? and calculate the distance!



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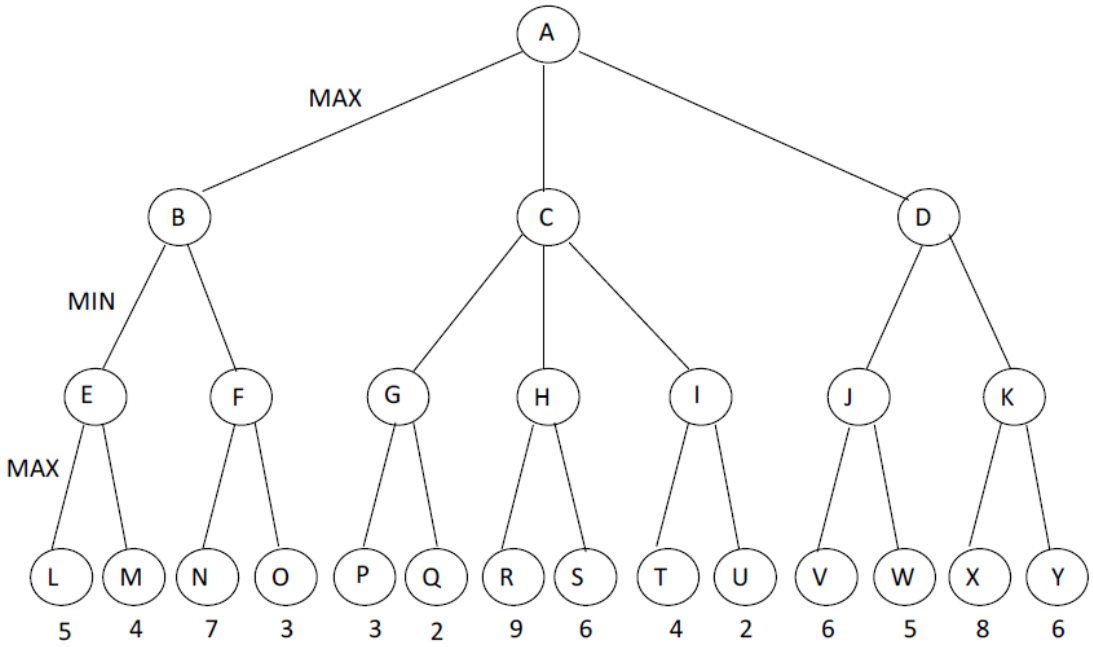
Given heuristic value as follow:

1. h(A) = 14
2. h(B) = 12
3. h(C) = 11
4. h(D) = 6
5. h(E) = 4
6. h(F) = 11
7. h(G) = 5
8. h(Z) = 0

2. **[LO 2, 20 points]** Look at the Adversarial Search image as follows and answer the questions:



a. What is the value of A?
b. How many steps does it take to get an A?
c. Mention A-pruning and / or B-pruning occurs at any node!

For the last question, please choose **ONLY ONE** between the following three questions (no. 3, 4 or 5)!

3. **[LO 4, 20 points]** A certain stock price has been observed to follow a pattern. If the stock price goes up one day, there's a 20% chance of it rising tomorrow, a 30% chance of it falling, and a 50% chance of it remaining the same. If the stock price falls one day, there's a 35% chance of it rising tomorrow, a 50% chance of it falling, and a 15% chance of it remaining the same. Finally, if the price is stable on one day, then it has a 50-50 change of rising or falling the next day.
   a. Write a matrix which is the transition matrix for this Markov chain, if we list states in the order: (rising, falling, constant)!
   b. Given the initial state vector (1, 0, 0), calculate the proportion of chance in **Third generation!**

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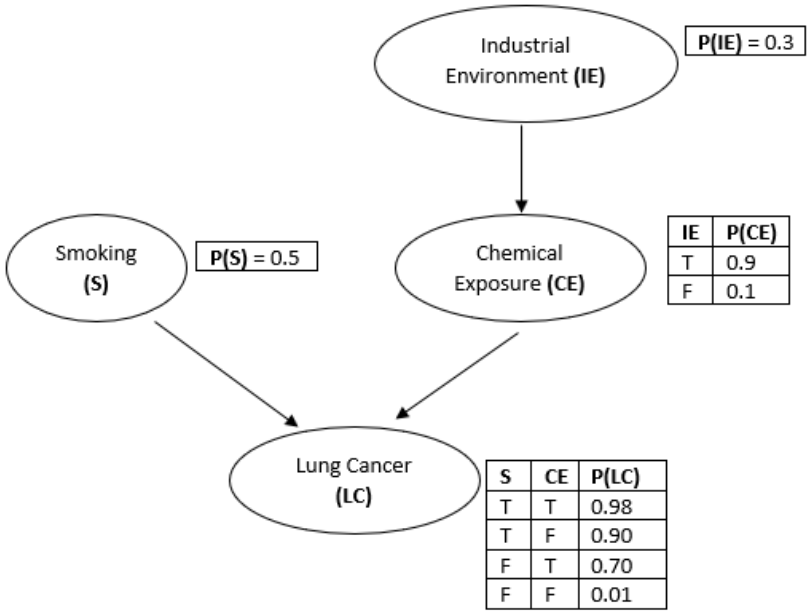
4. **[LO 4, 20 points]** Given the following Bayesian network :



IE	P(CE)
T	0.9
F	0.1

S	CE	P(LC)
T	T	0.98
T	F	0.90
F	T	0.70
F	F	0.01

Please calculate the probability whether someone is a **smoker** if s/he is suffering from **lung cancer** and living in a **non-industrial** area!

5. **[LO 4, 20 points]** Due to the latest war in Europe, we need to observe the old price. If the war become heavier that previous days, the oil price goes up one day, there's a 35% chance of it rising tomorrow, a 15% chance of it falling, and a 55% chance of it remaining the same. If the war getting lighter, the oil price falls one day, there's a 37% chance of it rising tomorrow, a 58% chance of it falling, and a 17% chance of it remaining the same. Finally, if the war is stop, the oiled price is stable on one day, then it has a 50-50 change of rising or falling the next day. **[20%]**
   c. Please provide the simulation using a matrix which is the transition matrix for this Markov chain, if we list states in the order: (rising, falling, constant)!
   d. Given the initial state vector (1, 0, 0), calculate the proportion of chance in **Third generation!**

-- Good luck --

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