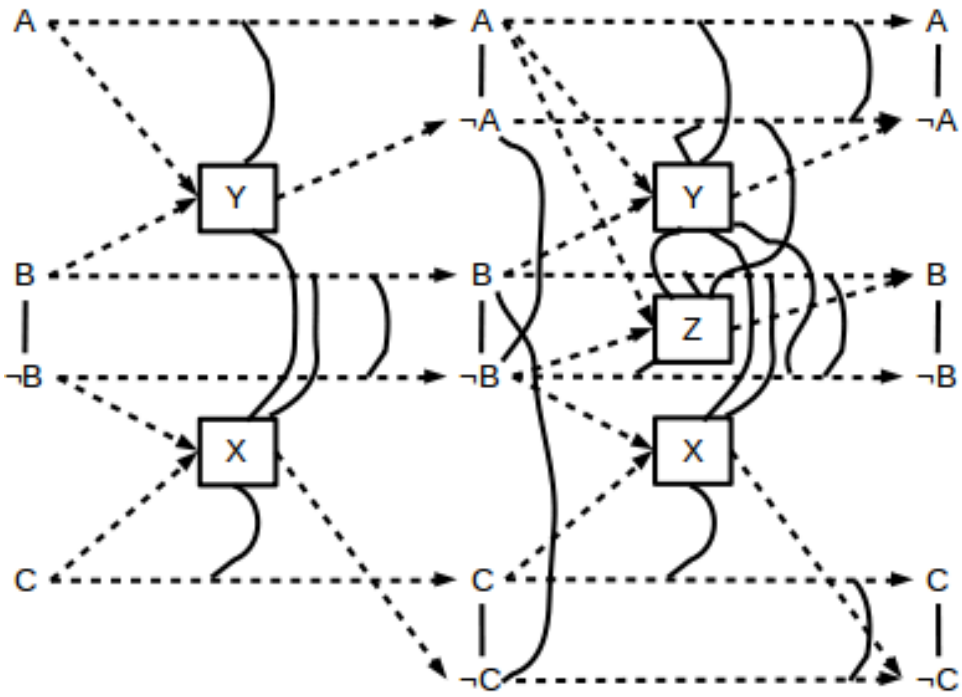
CSci 4511
Final

Name: _____

Student ID: _____

Instructions: The time limit is 120 minutes. Please write your answers in the space below. If you need more space, write on the back of the paper. The exam is open book and notes. You may use electronic devices to ONLY look at either an e-book version or electronic notes. You may not use the internet, program/run code or any other outside resources. (If you are typing on your keyboard/input device for anything other than ctrl-F to find words in the e-book or notes, this is probably not acceptable.) For all questions you must **show work**.

Problem (1) [15 points]
Find 3 independent errors with the following graphplan. Preconditions and effects are shown in dashed lines, while mutexes are in solid lines. You must clearly state why the places you indicate are errors.



Problem (2) [15 points]
Convert the following sentences into first order logic:
[5 points] (1) "Sally has a sister."
[5 points] (2) "Sally has at least two sisters."
[5 points] (3) "Sally has exactly two sisters."

Problem (3) [20 points]
Suppose you have the knowledge base (KB) below and wanted to ask: $KB \models (G \wedge P)$. Describe what you think is the most efficient method for a computer to solve this query (you do not need to actually find the entailment). Justify why your answer is better than other options.

KB = {
$\neg A \vee \neg B \vee C$
$\neg A \vee \neg D \vee E$
$\neg A \vee D$
$\neg B \vee \neg D \vee F$
$\neg B \vee \neg C \vee D$
$\neg B \vee \neg C \vee \neg E \vee G$
$\neg C \vee F$
$\neg C \vee \neg D \vee \neg E \vee G$
$\neg E \vee \neg F \vee G$
A
$\neg J \vee \neg K \vee L$
$\neg J \vee M$
$\neg J \vee \neg M \vee N$
$\neg K \vee \neg L \neg O \vee P$
$\neg K \vee \neg L \vee \neg M \vee \neg O \vee P$
$\neg K \vee N \vee \neg O$
$\neg L \vee O$
$\neg L \vee M \vee \neg O$
$\neg M \vee \neg O \vee \neg N \vee P$
J
K
$\neg R \vee T$
$\neg R \vee S \vee \neg T$
$\neg R \vee \neg U \vee V$
$\neg T \vee \neg S \vee \neg U \vee V$
$\neg U \vee \neg V \vee W$
$\neg U \vee V \vee \neg W$
R
$\neg B \vee \neg U \vee \neg X \vee Z$
$\neg C \vee \neg K \vee \neg Y \vee Z$
$\neg D \vee \neg K \vee Z$
$\neg G \vee \neg P \vee \neg W \vee X$
$\neg G \vee \neg P \vee \neg R \vee Y$
}

Problem (4) [15 points]

[10 points] (1) Consider the action below. Find the "reverse" action that you would need to use in backward search. (You do not need to do backward search, just invert the action.)

Action($Doh(x, y, z)$,
Preconditions: $Meh(x) \wedge \neg Ehh(x, y) \wedge Idk(x, z)$,
Effect: $Ehh(x, y) \wedge Ehh(x, z) \wedge \neg Meh(x)$)

[5 points] (2) When doing a forward search with planning, would it be best to consider this as a tree search or a graph search? Justify your answer.

Problem (5) [15 points]

[8 points] (1) Suppose you had a problem and were debating using either Monte-Carlo tree search or alpha-beta pruning to solve it. Identify the primary factors that should that should influence your choice. Then using these factors you identified, argue when you should use one approach over the other.

[7 points] (2) Rank the follow algorithms based on how much their memory usage scales to the problem size (from smallest to largest):
BFS, Uniform-cost search, A* (with a consistent heuristic), Beam-search, Genetic algorithm, Monte-Carlo tree search

Problem (6) [20 points]
Consider the following pay-off matrix for a game, where you are player 1. (Positive numbers mean you gain money, negative numbers mean you lose money.)

	Player 2, Action A	Player 2, Action B
Player 1, Action A	(P1=4, P2=4)	(P1=-8, P2=4)
Player 1, Action B	(P1=-1, P2=-2)	(P1=2, P2=-1)

[8 points] (1) Suppose your opponent is going to play the Nash equilibrium. Should you play this game (i.e. will you make money)? If so, how would you? If not, why not?

[8 points] (2) Suppose your opponent now realizes that you're pretty smart and says "I'm going to play action A 75% of the time and action B 25% of the time". Assume the opponent is telling the truth, should you play this game? If so, how would you? If not, why not?

[4 points] (3) Was the opponent smart or stupid to announce their strategy like this? Why or why not?