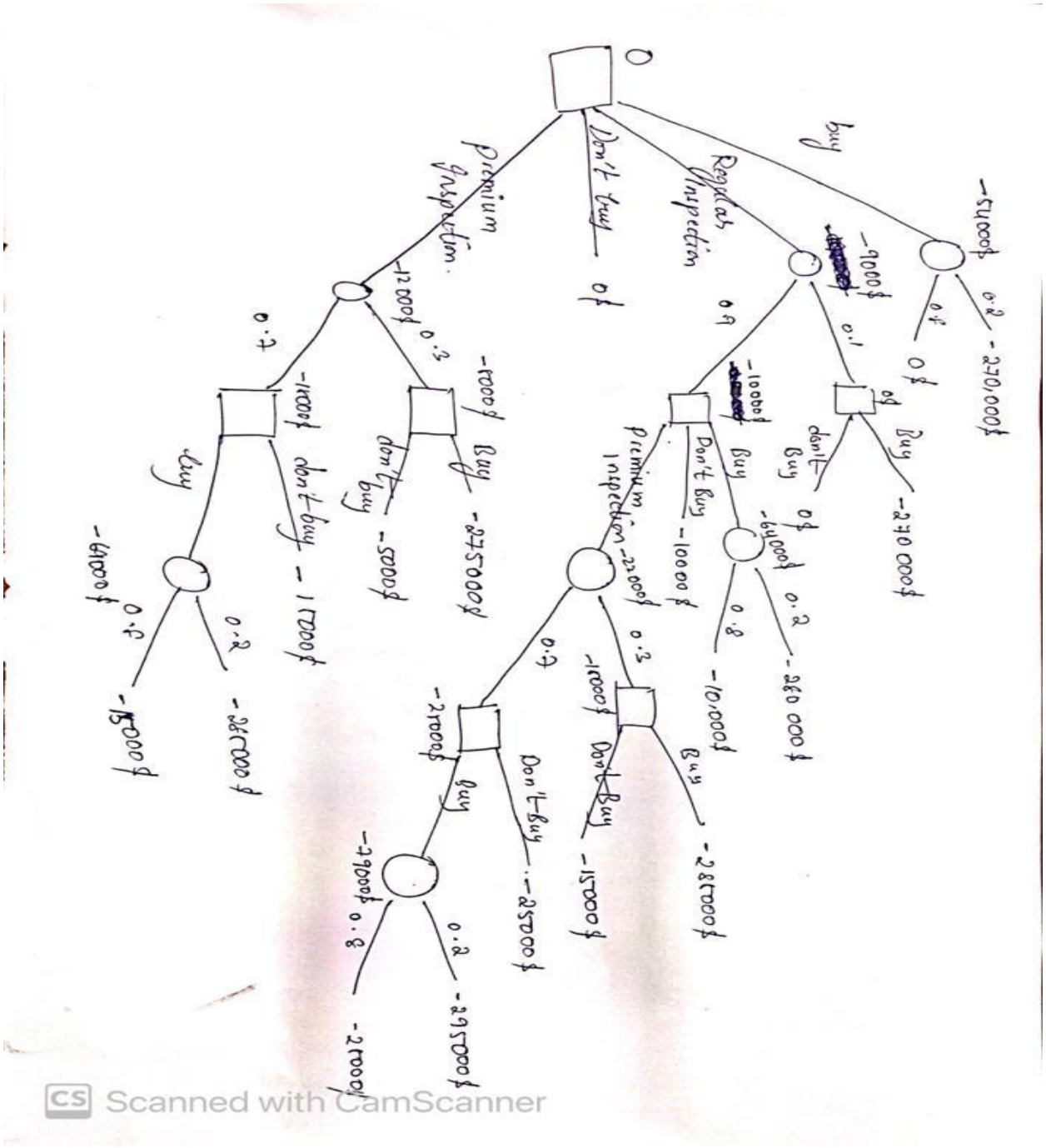
Assignment 4

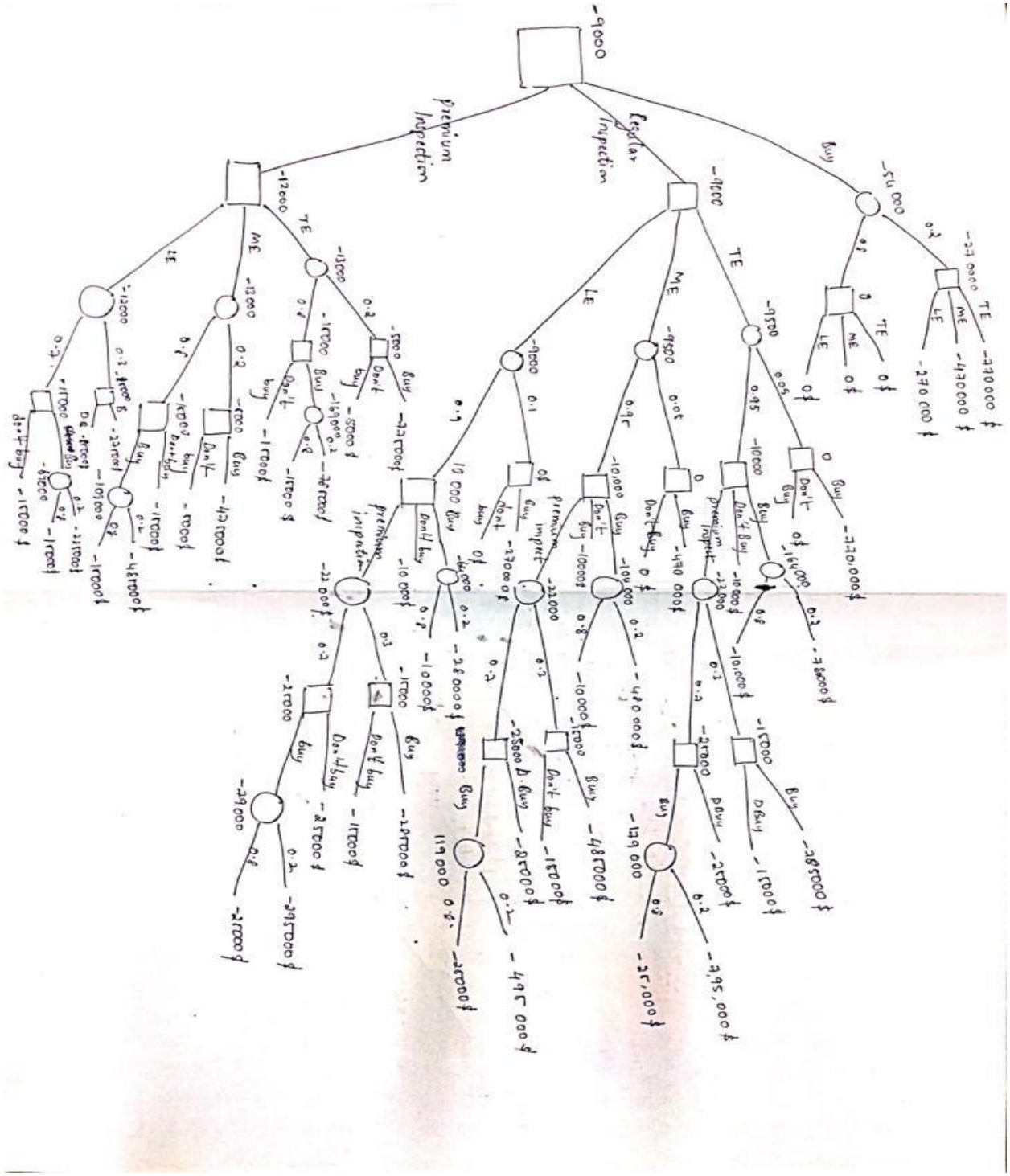
1.Decision Theory

a. Draw a complete decision tree for the problem as stated showing the value of each outcome as well as the best decision to make in each case.



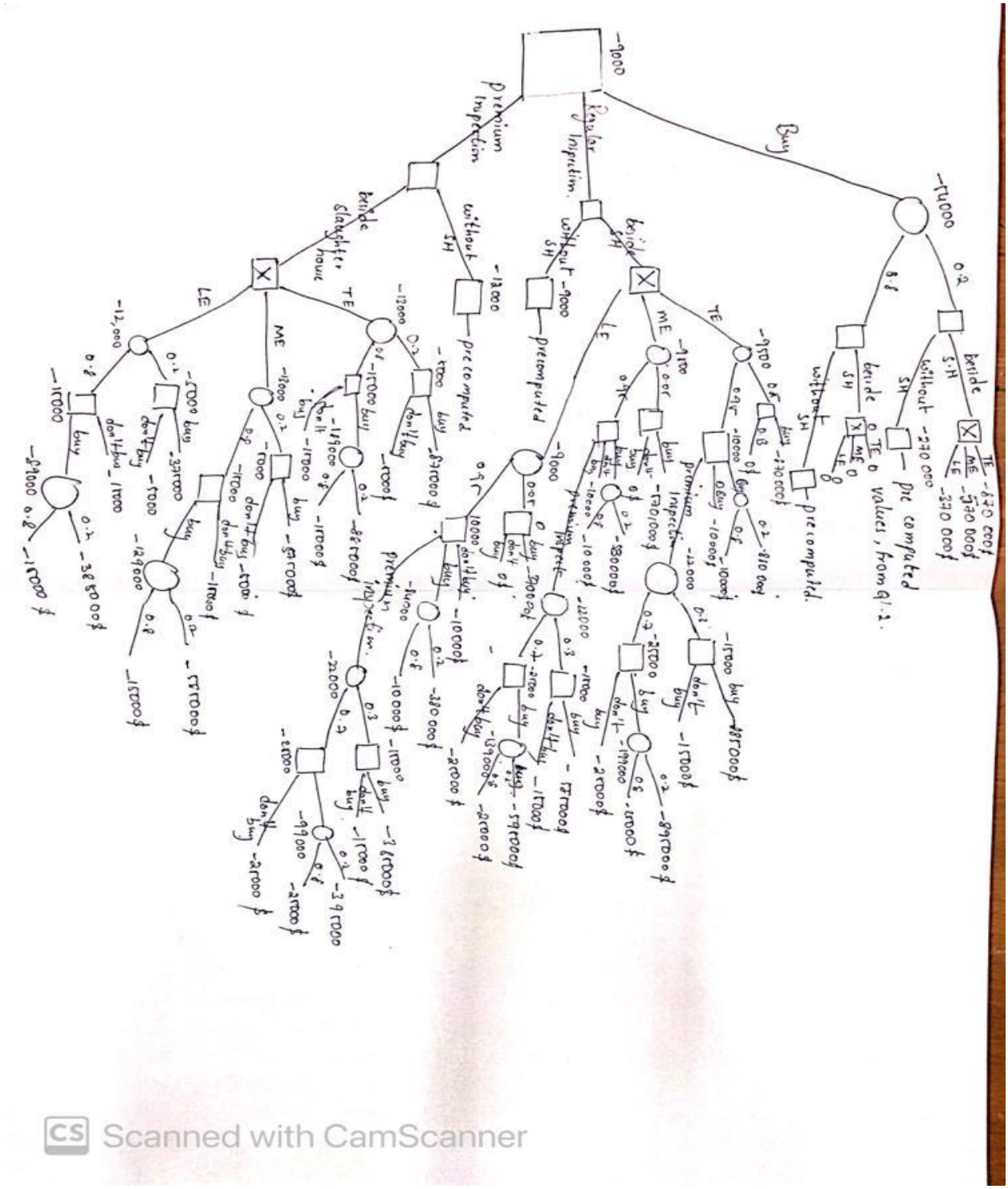
So the optimal solution for this problem is not to buy a house which has a value of 0.

b. Now, building on the decision tree above, suppose that you had to buy a house but you were given a choice of 3 homes, one at the top end of your budget ($800k), one in the middle ($500k), and the current choice. Each house has a chance of serious defects but the same lot value. However, the middle and upper houses have a lower chance of the inspection finding anything because the paint is new (standard inspection 5% premium 20%). Show the expanded decision tree with outcomes and decision values.



The optimal solution for this problem is to buy a lower end house which has a value of (-9000).

c. Finally, suppose that you have a chance that a new slaughterhouse will be built near your home which would cut the value down by $100k. The odds of this would be different for each house. What is the minimum chance of this happening that would make the house choices have equal value? Show the expanded tree and decision values along with your answer.



Note: All the precomputed values in the above diagram imply the values from the above Question 1.b. From the above diagram it is evident that even if we add slaughter house case, we will end up with the same answer as in the previous question(1-b). Because let's say if we take the probabilities as x, y and (1-y-x) for all the three houses having a slaughter house in the regular inspection case, then in order to get the minimum answer to get picked, we have to choose the values obtained on solving the below equation.

$$x*(-9000) + y*(-9500) + (1-y-x)*(-9500) = -9000$$
$$-9000x - 9500y - 9500 + 9500y + 9500x = -9000$$
$$500x - 9500 = -9000$$
$$500x = 500$$
$$x = 1.$$

So in order for the solution to be minimum which is (-9000) we have to choose values 1,0,0 as the probabilities. Instead of this, if we choose any different values that sum to 1 we always get a choice which is greater than (-9000) and is not acceptable any way. So different odds to pick a minimum choice is not possible for this problem and doesn't have any effect on the optimal solution.