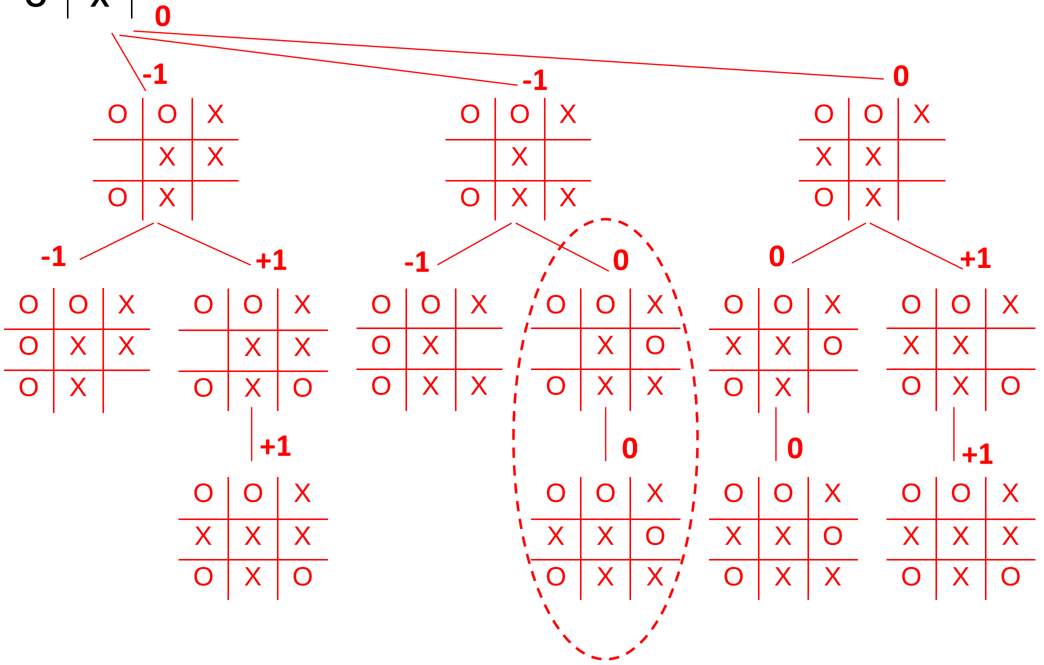
Discrete Mathematics Final Exam (Spring 2016)

No :
Name:

1. (30P) Tic-tac-toe is a game for two players (X and O) who take turns marking the spaces in a 3×3 grid. The player who succeeds in placing three of their marks in a horizontal, vertical, or diagonal row wins the game. When the game is as below, it is X's turn. For this situation, please go on to draw the game tree and comment α-β pruning on this tree.

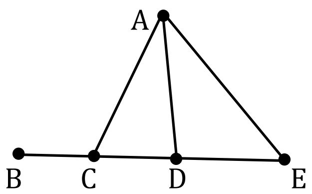
O	O	X
	X	
O	X	

Object function produces 1 for X, -1 for O, and 0 for equality.



For this tree, a required pruning is shown by dashed circle. It is an alpha (α) cut-off.

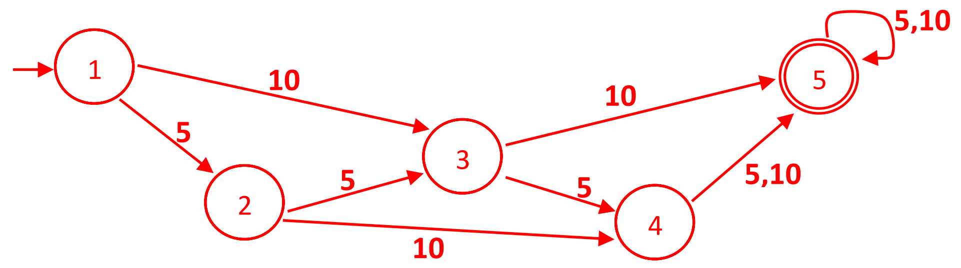
2. (30P) Find the chromatic number of graph given below. Comment whether there is a Hamilton circuit or not. If there is, write it, otherwise explain the cause.



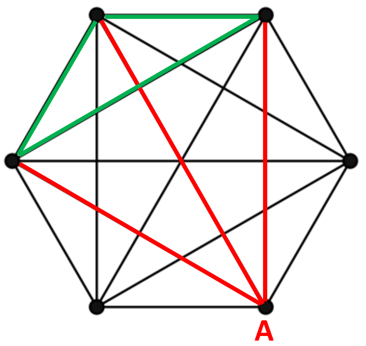
Chromatic number of the graph is 3. Here, C and E can be red, B and D can be blue, and A can be green.

There is no Hamilton circuit possibility here. Because B has only one neighbour, it can not be in any circuit. Also by edge removal, Dirac's, or Ore's theorems, we can conclude it.

3. (30P) Draw such a deterministic finite state automaton which is defined on {5, 10}* that it accepts only 20 as the total. You can consider each symbol as a coin.



4. (10P) For K_6 graph, we can use only 0 or 1 for the weights of edges. Prove that we can find at least one triangle in which its total weight is 3 or 0.



1. Let weights (0 and 1) represent red and green colors.
2. If we give label any point (vertex) as A, we are sure that it has at least three edges with the same weight (0 or 1). This situation is colored by red.
3. If two of the points on these three edges are adjacent to each other with the same weight, then we have a red triangle.
4. Otherwise we have a green triangle.