Physics 2605H: Worksheet I

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Problem 1.

(a) If X choses to measure X_3, in (3,1), what would be the classical states in each of the occupied states?

(b) Give examples for per position states in the figure?

(c) Are the states entangled? Why do you think so?

Solution 1.

(a) (3,1) collapses to X_3
    (3,3) collapses to O_2
    (1,1) collapses to X_1
    (1,2) collapses to O_4

(b) X_1 is entangled with O_2
    O_2 is entangled with X_3
    X_3 is entangled with O_4
    O_4 is entangled with X_1

(c) Yes, every state is entangled because collapsing any state will result in the collapse of all other states.

Problem 2.

(a) X will win. Regardless of how O plays (2,1) is guaranteed to be X.

(b) Not really, you could force a tie by measuring O_8 in (3,2).

Solution 2.

Problem 3. Provide the game log which leads to following result or something similar.

Solution 3. Filling in the grid in a spiral starting from (1,1) we get:
Cyclic loop occurs!!
Block_1 collapsed (Measure)
Block_2 collapsed (X2 : $[1 \rightarrow 2]$)
Block_3 collapsed (O3 : $[2 \rightarrow 3]$)
Block_6 collapsed (X4 : $[3 \rightarrow 6]$)
Block_9 collapsed (O5 : $[6 \rightarrow 9]$)
Block_8 collapsed (X6 : $[9 \rightarrow 8]$)
Block_7 collapsed (O7 : $[8 \rightarrow 7]$)
Block_4 collapsed (X8 : $[7 \rightarrow 4]$)
Block_5 collapsed (O9 : $[4 \rightarrow 5]$)
Game Over !!