PSet 3:

Note: adj matrices & networks are in the linked github repo. Running the package also prints the average in degree but I will include it here as well.
The graphs are labeled by int representation of state forspace.

1) See repo.

2) See repo.

3) In class it was mentioned self-loops aren't allowed. In case they are included in the HW, all graphs have avg. in degree $= 1$. The following is for self-loopless graphs

Since $\sum_{v \in V} d_{in}(v) = \sum_{v \in V} d_{out}(v)$, and all nodes have one outgoing edge save nodes w/ loops, we can say

$$Avg_{in} = \frac{\sum_{v \in V} d_{in}(v)}{|V|} = \frac{|V| - |E_{loops}|}{|V|}$$

4 cell: $Avg_{in} = \frac{|V| - |E_{loops}|}{|V|} = \frac{2^4 - 1}{2^4} = \frac{15}{16} =$

5 cell: $Avg_{in} = \frac{|V| - |E_{loops}|}{|V|} = \frac{2^5 - 1}{2^5} = \frac{31}{32}$

It tells you how many edges are self-loops. (which are acc. pts)

4) so not a tree.

4 cell: Not including the self-loop, there are two cycles of length 2.
It is also disconnected w/ 3 components of order 4, 6, 6.

5 cell: Not including the self-loop, there are no cycles.
So, by def, it is a forest. Further, it is connected, so it is a tree.

5) 4 cell: cycles between 1101 & 0111 as well as 1011 & 1110.
0000 is an attractor (self-loop)

5 cell: no cycles,
00000 is an attractor.

6) Since 6 isn't prime it should have multiple components
I'd guess there are cycles, & it will look more similar to 4 cells
instead of 5.