

2-1

- (a) It will be a scale-free network.
- (b) Three basic properties are: growing; heterogeneous; power-law distribution
- (c) This is not a problem technically, because $a > 0$ so the preferential attachment probability is not zero even for isolated nodes; consequently, when growing time is long enough, the network will become connected.
- (d) Yes, this model can induce the BA model when $a = m$ and the network becomes undirected thereby in-degree becomes degree.

2-2

Model A: The resultant network is a homogeneous network because the new incoming edges try to tend to connect to small nodes. It will be similar to a random network. It (i) has a fixed size, (ii) is homogeneous, and (iii) has a Poisson node-degree distribution.

Model B: The resultant network is the complementary network of a random network, therefore is also a random network. It (i) has a fixed size, (ii) is homogeneous, and (iii) has a Poisson node-degree distribution.

Model C: The resultant network is a spanning tree. It (i) has nodes and edges, (ii) contains no circuits but the addition of any new edge creates exactly one circuit, and (iii) its every cut-set has an edge in common with the original network.

Model D: Yes, it is a good model for the Internet. 3 advantages of this modeling: (i) it has a spanning tree (the initial tree); (ii) small nodes (PCs) preferentially attach to big nodes (servers); (iii) it is heterogeneous therefore should have a power-law-like node-degree distribution.

2-3

(i) is bad and (ii) is good technically. Because following rule (i) to do rewiring, there is a possibility that before a certain node the edge is disconnected at the last end, but after this same node the next edge is disconnected at the first end. As a result, this node will become isolated (see the figure below). Following rule (ii), however, no node can become isolated because the rewired edge will connect the original node to another node in the network.

