

DPCN (Quiz 2)

Set2

1. Explain the basic ingredients required for generating a BA graph. Prove that rate at which an existing node i acquires links $(\frac{dk_i}{dt})$ as a result of new nodes connecting to it is proportional to t^β , where $\beta = \frac{1}{2}$, k is the degree, and t is time. (Marks 2+2=4)

2. Prove that, in Erdos-Renyi network the degree distribution will follow Poisson distribution if connection probability is very small, and number of nodes are extremely large. What will be the average degree and second moment?

(Marks 3+1=4)

3. If $x_{n+1} = f(x_n)$; Find the condition where the system will show a stable fixed point

$$(x_{n+1} = f(x_n) = x^*).$$

If $f(x_n) = rx_n(1 - x_n)$. Find the fixed points, and find the stability conditions.

(Marks 2+3=5)

4. Find out the fixed points of Lorenz oscillator. Construct the associated Jacobians

(Marks 4).

[eigenvalue analysis is not required.]

$$\dot{x} = \sigma(y - x),$$

$$\dot{y} = \rho x - y - xz,$$

$$\dot{z} = -\beta z + xy,$$