A3

Graph for Question 1

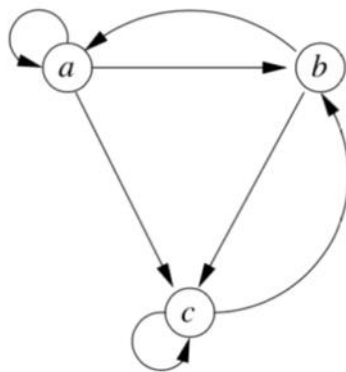Figure 1: The graph for Problem 1.

$\beta = 0.8$

$$M = \begin{bmatrix} \frac{1}{3} & \frac{1}{2} & 0 \\ \frac{1}{3} & 0 & \frac{1}{2} \\ \frac{1}{3} & \frac{1}{2} & \frac{1}{2} \end{bmatrix} \qquad V_0 = \begin{bmatrix} \frac{1}{3} \\ \frac{1}{3} \\ \frac{1}{3} \end{bmatrix}$$

$$V[i] = \beta \sum_{j \in N^+[i]} \frac{V_0[i]}{\deg^+[i]} + (1-\beta)\frac{1}{n}$$

$$V[0] = 0.8\left(\frac{(1/3)}{3} + \frac{(1/3)}{2} \right) + (0.2)\frac{1}{3}$$

$$= 0.2888$$

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$$V[1] = 0.8 \left(\frac{(1/3)}{3} + \frac{(1/3)}{2} \right) + (0.2)\frac{1}{3}$$

$$= 0.2888$$

$$V[2] = 0.8 \left(\frac{(1/3)}{3} + \frac{(1/3)}{2} + \frac{(1/3)}{2} \right) + (0.2)\left(\frac{1}{3}\right)$$

$$= 0.4222$$

$$\therefore \quad V = \begin{bmatrix} 0.2888 \\ 0.2888 \\ 0.4222 \end{bmatrix}$$
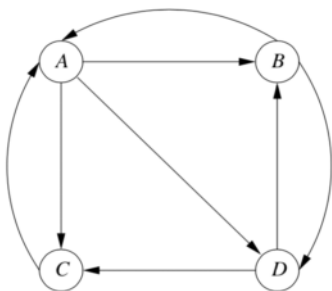
With 75 iterations:

A = 0.25925926
B = 0.30864198
C = 0.43209877

2

$$M = \begin{bmatrix} 0 & \frac{1}{2} & 1 & 0 \\ \frac{1}{3} & 0 & 0 & \frac{1}{2} \\ \frac{1}{3} & 0 & 0 & \frac{1}{2} \\ \frac{1}{3} & \frac{1}{2} & 0 & 0 \end{bmatrix} \qquad v_0 = \begin{bmatrix} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \end{bmatrix}$$

Question 4:

$$a = \begin{bmatrix} 1/2 \\ 1/2 \end{bmatrix} \qquad h = \begin{bmatrix} 1/2 \\ 1/2 \end{bmatrix}$$

$$a = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{bmatrix} \qquad h = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$$

$$a[i] = \sum_{j \in N^+} h[j]$$

$$h[i] = \sum_{j \in N^-} a[j]$$

$$a = \frac{a}{\|a\|_2} \quad , \quad h = \frac{h}{\|h\|_2}$$

after first iteration:

$$a = \begin{bmatrix} 0.5 \\ 0.5 \\ 0.5 \\ 0.5 \end{bmatrix} \qquad h = \begin{bmatrix} 0.7071 \\ 0.4714 \\ 0.2357 \\ 0.4714 \end{bmatrix}$$

After 50 iterations:

$$a = \begin{bmatrix} 0.1745 \\ 0.6035 \\ 0.6035 \\ 0.4910 \end{bmatrix} \qquad h = \begin{bmatrix} 0.7739 \\ 0.3033 \\ 0.0795 \\ 0.5501 \end{bmatrix}$$

a = [0.17451572 0.60350854 0.60350854 0.49101849]
h = [0.77394748 0.3033438 0.07954252 0.55014619]