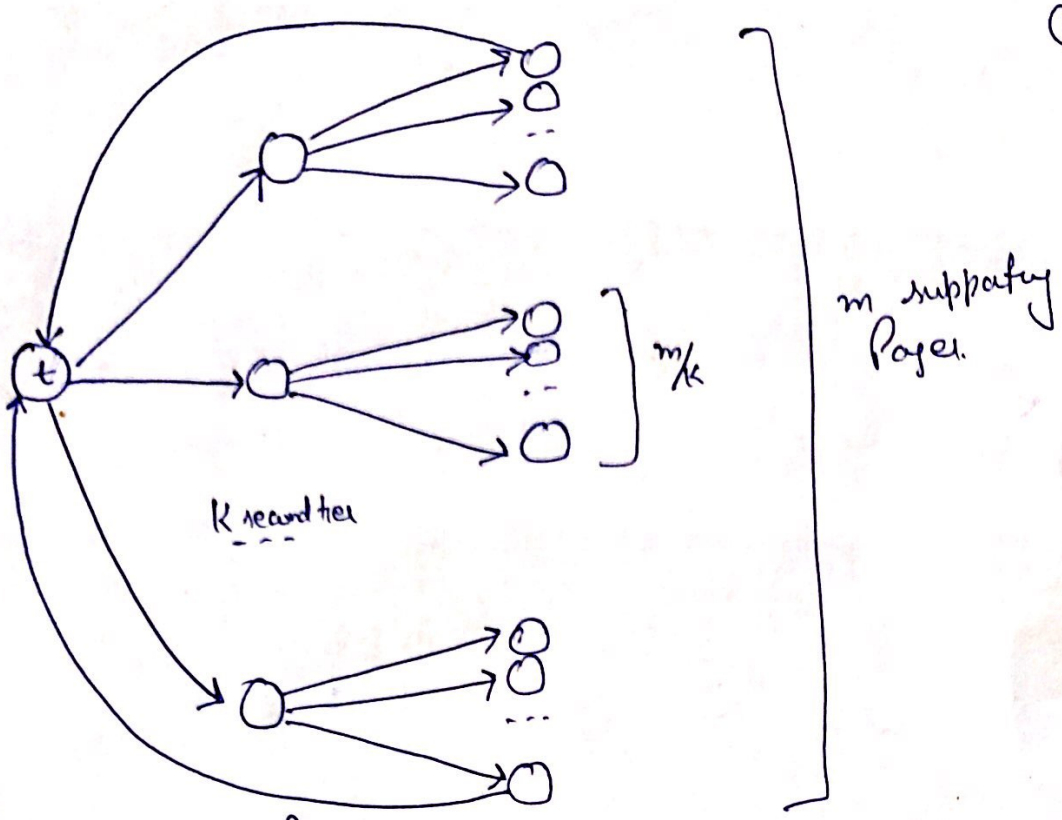

inputs Total Supporting Pages m
Total Second Tier Pages k
each second tier Page links to m/k supporting Pages
each supporting Page links to t
t links to each of k second tier Pages
Probability for random Teleport $\beta = 0.85$
Page Rank Contributed to t from out side is x
Total Number of Pages in Web n

Let y be PageRank of (t)

Equation to get cufficient values for

$$y = ax + b\frac{m}{n} + c\frac{k}{n}$$

find a, b, and c

Solution Page Rank of each second tier Page is.

$$y_k \Rightarrow \frac{\beta y}{k} + \frac{(1-\beta)}{n} \quad \text{——} \quad (1)$$

Page Rank of each of supporting Pages connected to one second tier Page

$$y_3 \Rightarrow \frac{\beta y_k}{(m/k)} + \frac{(1-\beta)}{n} \Rightarrow \frac{k\beta y_k}{m} + \frac{(1-\beta)}{n}$$

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(1) As we know each supporting Page is linked to (t) hence is contributing to its PageRank, (2) also external Pages are contributing to PageRank of t. and (3) $(1-\beta)/n$ the share of fraction $(1-\beta)$ of PageRank that belongs to t

Hence.

$$y = \underbrace{x}_{\text{external PageRank}} + \underbrace{\beta m \left(\frac{k \beta y_k}{m} + \frac{1-\beta}{n} \right)}_{\beta \text{ taxed PageRank from supporting Pages}} + \underbrace{\frac{(1-\beta)}{n}}_{(1-\beta)/n \text{ share}}$$

For Big n Can be ignored as ratio will be zero (given in question)

$$= x + \frac{\beta m \cdot k \beta y_k}{m} + \frac{m \beta (1-\beta)}{n}$$

$$= x + k\beta^2 y_k + \beta(1-\beta)\frac{m}{n}$$

Let Fill in y_k from equation (1)

$$y = x + k\beta^2 \left(\frac{\beta y}{k} + \frac{(1-\beta)}{n} \right) + \beta(1-\beta)\frac{m}{n}$$

$$= x + \frac{k \beta^2 \cdot \beta y}{k} + \beta^2(1-\beta)\frac{k}{n} + \beta(1-\beta)\frac{m}{n}$$

$$y = x + \beta^3 y + \beta^2(1-\beta)\frac{k}{n} + \beta(1-\beta)\frac{m}{n}$$

Solve for y.

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$$y(1-\beta^3) = x + \beta^2(1-\beta)\frac{k}{n} + \beta(1-\beta)\frac{m}{n}$$

$$y = \frac{1}{(1-\beta^3)} \cdot x + \frac{\beta^2(1-\beta)}{(1-\beta^3)} \cdot \frac{k}{n} + \frac{\beta(1-\beta)}{(1-\beta^3)} \cdot \frac{m}{n}$$

Re-organize as per required order of

$$y = ax + b\frac{m}{n} + c\frac{k}{n}$$

$$y = \frac{1}{(1-\beta^3)} x + \frac{\beta(1-\beta)}{(1-\beta^3)} \frac{m}{n} + \frac{\beta^2(1-\beta)}{(1-\beta^3)} \frac{k}{n}$$

we have.

$$a = \frac{1}{1-\beta^3}, \quad b = \frac{\beta(1-\beta)}{(1-\beta^3)}, \quad c = \frac{\beta^2(1-\beta)}{(1-\beta^3)}$$

given $\beta = 0.85$

$$a = 2.59151, \quad b = \frac{0.1275}{0.385875} \simeq 0.33042, \quad c = \frac{0.108375}{0.385875} \simeq 0.280855$$

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