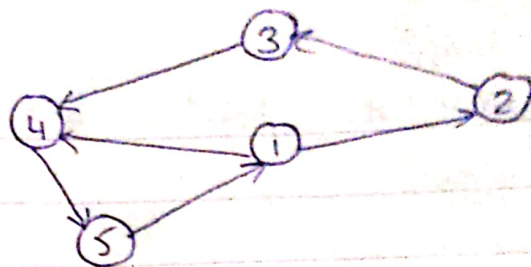


72 Calculate HITS score:

hubscore = \sum auth scores of ~~outdegree~~ ^{outdegree}
 auth score = \sum hubscores of ~~indegree~~ ^{indegree}



① take all hubscores = 1

$$H(1) = H(2) = H(3) = H(4) = H(5) = 1$$

find authority scores:

$$\text{auth}(1) = H(5) = 1$$

$$\text{auth}(2) = H(1) = 1$$

$$\text{auth}(3) = H(2) = 1$$

$$\text{auth}(4) = H(3) + H(1) = 2$$

$$\text{auth}(5) = H(4) = 1$$

$$\text{auth} = \langle 1, 1, 1, 2, 1 \rangle$$

normalised authority scores:

$$\text{auth}(1) = 1/6 \quad \text{auth}(2) = 1/6 \quad \text{auth}(3) = 1/6 \quad \text{auth}(4) = 2/6 = 1/3$$

$$\text{auth}(5) = 1/6 \quad \text{auth}' = \langle 1/6, 1/6, 1/6, 1/3, 1/6 \rangle$$

② use those authority scores to find new hubscores.

$$H(1) = \text{auth}(4) + \text{auth}(2) = 1/3 + 1/6 = 3/6 = 1/2$$

$$H(2) = \text{auth}(3) = 1/6$$

$$H(3) = \text{auth}(4) = 1/3$$

$$H(4) = \text{auth}(5) = 1/6$$

$$H(5) = \text{auth}(1) = 1/6$$

$$\langle 1/2, 1/6, 1/3, 1/6, 1/6 \rangle$$

$$\text{normalise: total} = 1/2 + 1/6 + 1/3 + 1/6 + 1/6 = 8/6 = 4/3$$

$$H(1) = 1/2 / 4/3 = 3/8$$

$$H(2) = 1/6 / 4/3 = 3/24 = 1/8$$

$$H(3) = 1/3 / 4/3 = 1/4$$

$$H(4) = 1/6 / 4/3 = 1/8$$

$$H(5) = 1/6 / 4/3 = 1/8$$

$$\text{hub}' = \langle \frac{3}{8}, \frac{1}{8}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8} \rangle$$

③ authority scores:

$$\text{auth}(1) = H(5) = 1/8$$

$$\text{auth}(2) = H(1) = 3/8$$

$$\text{auth}(3) = H(2) = 1/8$$

$$\text{auth}(4) = H(3) + H(1) = 1/4 + 3/8 = 5/8$$

$$\text{auth}(5) = H(4) = 1/8$$

$$\text{auth} = \langle 1/8, 3/8, 1/8, 5/8, 1/8 \rangle$$

Ans:

normalize: total = $\frac{1}{8} + \frac{3}{8} + \frac{1}{8} + \frac{5}{8} + \frac{1}{8} = \frac{11}{8}$

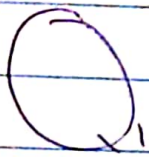
auth(1) = $\frac{1}{8} / \frac{11}{8} = \frac{1}{11}$ auth(2) = $\frac{3}{8} / \frac{11}{8} = \frac{3}{11}$

auth(3) = $\frac{1}{8} / \frac{11}{8} = \frac{1}{11}$ auth(4) = $\frac{5}{8} / \frac{11}{8} = \frac{5}{11}$

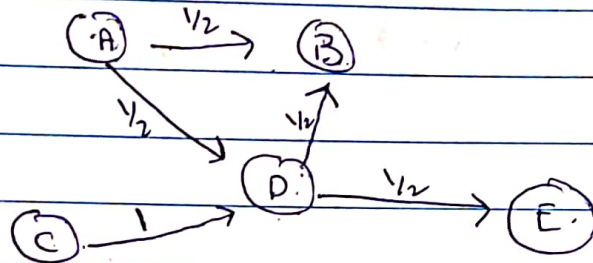
auth(5) = $\frac{1}{8} / \frac{11}{8} = \frac{1}{11}$

auth' = $\langle \frac{1}{11}, \frac{3}{11}, \frac{1}{11}, \frac{5}{11}, \frac{1}{11} \rangle$

done till 3 iterations as told by main.



Calculate Page Rank



Formula $\left(\frac{1-d}{N}\right) + d(P(i)) + d \frac{\sum PR(\text{sink})}{N}$

$\therefore N = 5$

$d = 0.85$

sink nodes = 2 Iteration 0

$$Pr(A) = \frac{(0.03)}{5} + 0.85(0) + 0.85 \left(\frac{1}{5} + \frac{1}{5} \right) = 0.098$$

$$Pr(B) = \frac{1 - 0.85}{5} + 0.85 \left(\frac{1}{2} \times \frac{1}{5} + \frac{1}{2} \times \frac{1}{5} \right) + 0.85 \left(\frac{1}{5} + \frac{1}{5} \right) = 0.268$$

$$Pr(C) = \frac{1 - 0.85}{5} + 0.85(0) + 0.85 \left(\frac{1}{5} + \frac{1}{5} \right) = 0.098$$

$$Pr(D) = \frac{1 - 0.85}{5} + 0.85 \left(\frac{1}{2} \times \frac{1}{5} + 1 \times \frac{1}{5} \right) + 0.85 \left(\frac{1}{5} + \frac{1}{5} \right) = 0.268$$

$$Pr(E) = \frac{1 - 0.85}{5} + 0.85 \left(\frac{1}{2} \times \frac{1}{5} \right) + 0.85 \left(\frac{1}{5} + \frac{1}{5} \right) = 0.183$$

