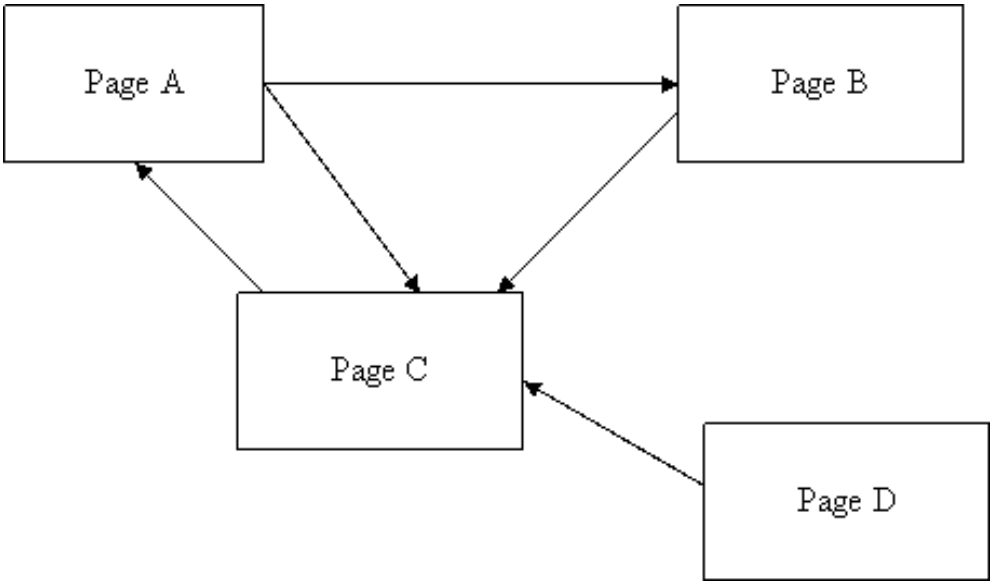
The following question are related to the WWW-graph of Fig



1) Which node has the highest degree centrality? Second highest?
ans.

Indegree centrality highest for "Page C"
Outdegree centrality highest for "Page A"
Second highest Indegree centrality for "Page A" and "Page B"
Second highest outdegree centrality for "Page B","page C" and "page D"
Overall highest degree centrality for "Page c"
Overall second highest degree centrality for "page a"

2) Compute the normalized link matrix for the WWW-graph

	A	B	C	D
A	0	1	1	0
B	0	0	1	0
C	1	0	0	0
D	0	0	1	0

	A	B	C	D	
A	0	1	1	0	
B	0	0	1	0	
C	1	0	0	0	
D	0	0	1	0	
	1	1	3	0	

column normalized

	A	B	C	D
A	0	1	1/3	0
B	0	0	1/3	0
C	1	0	0	0
D	0	0	1/3	0

3) Calculate the principal eigenvector for the above matrix
Ans. for the eigen values , determinate of matrix is zero

$-\lambda$	1	1/3	0
0	$-\lambda$	1/3	0
1	0	$-\lambda$	0
0	0	1/3	$-\lambda$

Which gives $3\lambda^4$-λ^2-λ= 0

the greatest root is roughly 0.8 . Principal eigen vector corresponding to wihch is

1.92
1
2.4
1

4) Which Page has the highest page rank

Page rank is denoted by column vector R where R satisfy

$$R = \begin{bmatrix} (1\text{-}d)/N \\ (1\text{-}d)/N \\ (1\text{-}d)/N \\ (1\text{-}d)/N \end{bmatrix} + d[A] \text{ X } R$$

where A is normalized link matrix, and d is damping factor

$$R = \begin{bmatrix} .15/4 \\ .15/4 \\ .15/4 \\ .15/4 \end{bmatrix} + 0.85 \begin{bmatrix} 0 & 1 & 1/3 & 0 \\ 0 & 0 & 1/3 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1/3 & 0 \end{bmatrix} \text{ X } R$$

Solving the linear equation gives R which is

0.89
0.7
1.14
0.7

5) Do you observe any mismatch between the result of (1) and (4) ? State the reasons for this/these mismatch (if any)

ans. Well in (1) we just calculated the rank base on the immediate connectivity of a particular node. If degree is more than rank is more. while in the page rank algorithm, rank of a node is based on the rank of nodes it is connected to and this goes on recursively.

6) Recalculate the PageRanks for d = 0.5. Is there any difference in the results from (4)? What does this difference (if any) mean?

ans. Recalculating for d = 0.5 gives the following value of rank vector

1/4
1
1/4
1