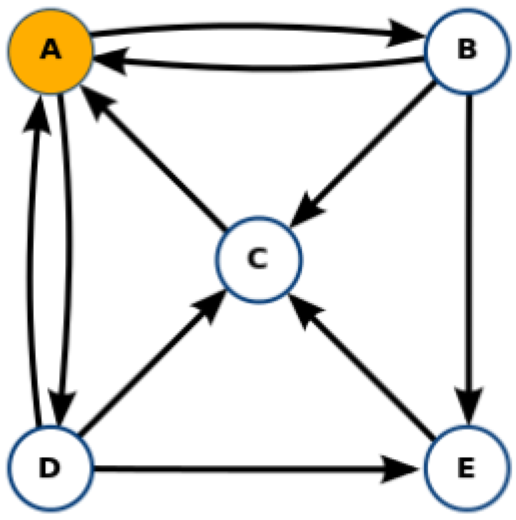
Name: Vangipuram Srinivasa Sarath Chandra
Roll : 21BCE9853
Lab: 1
Date: 07/june/2022

Question 1:



Solution:

From the above graph we extract the following probability matrix it works as follows
Let N be the total number of pages. The matrix $A = [a_{ij}]$ where,

$a_{ij} = \frac{1}{L(j)}$, if there is a link from i to j
0, for all other cases

```
%    A    B    C   D    E
A = [0    1/3  1  1/3   0  ];
B = [1/2  0    0   0    0  ];
C = [0    1/3  0  1/3   1 ];
D = [1/2   0   0   0    0  ];
E = [0    1/3  0  1/3   0  ];

rank_mat = [A;B;C;D;E]
```

```
rank_mat = 5×5
         0    0.3333    1.0000    0.3333         0
    0.5000         0         0         0         0
         0    0.3333         0    0.3333    1.0000
    0.5000         0         0         0         0
         0    0.3333         0    0.3333         0
```

By the property of transistion matrices, the maximum eigen value of the transistion matrix must be 1. Hence, the eigen vector corresponding to the eigen value 1 will be extracted by taking the first column from the eigen matrix.

```
[EigV, EigD] = eigs(rank_mat)
```

```
EigV = 5×5 complex
    -0.6975 + 0.0000i   0.6386 + 0.0000i  -0.0175 - 0.5057i ...
    -0.3487 + 0.0000i  -0.4447 + 0.0000i  -0.3604 + 0.0894i
    -0.4650 + 0.0000i  -0.1621 + 0.0000i   0.5798 + 0.0000i
    -0.3487 + 0.0000i  -0.4447 + 0.0000i  -0.3604 + 0.0894i
    -0.2325 + 0.0000i   0.4128 + 0.0000i   0.1585 + 0.3269i

EigD = 5×5 complex
     1.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i ...
     0.0000 + 0.0000i  -0.7181 + 0.0000i   0.0000 + 0.0000i
     0.0000 + 0.0000i   0.0000 + 0.0000i  -0.1410 + 0.6666i
     0.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i
     0.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i
```

```
u = EigV(:, 1)
```

```
u = 5×1
     -0.6975
     -0.3487
     -0.4650
     -0.3487
     -0.2325
```

normalizing the eigen vector such that sum(page rank matrix) = 1.

```
page_rank_vector = u/sum(u)
```

```
page_rank_vector = 5×1
      0.3333
      0.1667
      0.2222
      0.1667
      0.1111
```

After applying the **Dampning:**

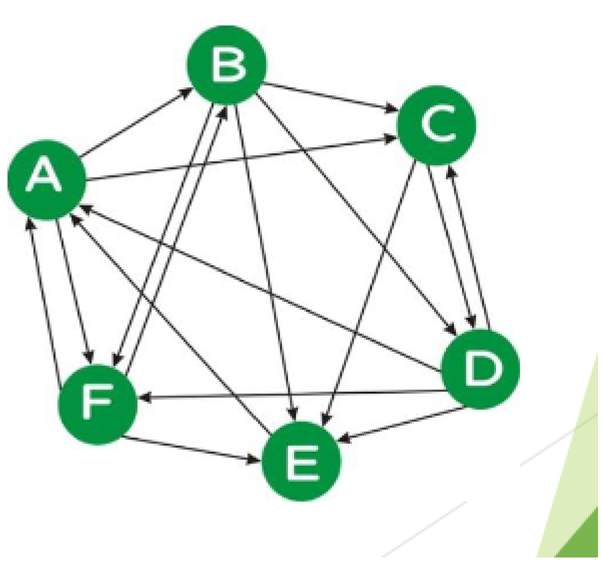
```
a = 0.85;
n = 1/length(page_rank_vector);
p =  a* page_rank_vector + (1-a)*n;
disp(p)
```

```
0.3133
0.1717
0.2189
0.1717
0.1244
```

The rankings are as follows:

1. A
2. C
3. B
4. D
5. E

Question 2:



Solution:

From the above graph we extract the following probability matrix it works as follows
Let N be the total number of pages. The matrix $A = [a_{ij}]$ where,

$a_{ij} = \frac{1}{L(j)}$, if there is a link from i to j
0, for all other cases

```
%    A     B    C    D    E   F
A = [0     0    0   1/4   1   1/3];
B = [1/3   0    0    0    0   1/3];
C = [1/3  1/4   0   1/4   0    0 ];
D = [ 0   1/4  1/2   0    0    0 ];
E = [ 0   1/4  1/2  1/4   0   1/3];
F = [1/3  1/4   0   1/4   0    0 ];

rank_mat = [A;B;C;D;E;F]
```

```
rank_mat = 6×6
         0         0         0    0.2500    1.0000    0.3333
    0.3333         0         0         0         0    0.3333
    0.3333    0.2500         0    0.2500         0         0
         0    0.2500    0.5000         0         0         0
         0    0.2500    0.5000    0.2500         0    0.3333
    0.3333    0.2500         0    0.2500         0         0
```

By the property of transistion matrices, the maximum eigen value of the transistion matrix must be 1. Hence, the eigen vector corresponding to the eigen value 1 will be extracted by taking the first column from the eigen matrix.

```
[EigV, EigD] = eigs(rank_mat)
```

```
EigV = 6×6 complex
   0.6215 + 0.0000i   0.7115 + 0.0000i   0.7115 + 0.0000i ...
   0.3247 + 0.0000i  -0.2490 - 0.2616i  -0.2490 + 0.2616i
   0.3527 + 0.0000i  -0.0889 - 0.2005i  -0.0889 + 0.2005i
   0.2575 + 0.0000i  -0.1704 + 0.2784i  -0.1704 - 0.2784i
   0.4395 + 0.0000i  -0.1143 + 0.3842i  -0.1143 - 0.3842i
   0.3527 + 0.0000i  -0.0889 - 0.2005i  -0.0889 + 0.2005i

EigD = 6×6 complex
   1.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i ...
   0.0000 + 0.0000i  -0.2622 + 0.5438i   0.0000 + 0.0000i
   0.0000 + 0.0000i   0.0000 + 0.0000i  -0.2622 - 0.5438i
   0.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i
   0.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i
   0.0000 + 0.0000i   0.0000 + 0.0000i   0.0000 + 0.0000i
```

```
u = EigV(:, 1)
```

```
u = 6×1
    0.6215
    0.3247
    0.3527
    0.2575
    0.4395
    0.3527
```

normalizing the eigen vector such that sum(page rank matrix) = 1.

```
page_rank_vector = u/sum(u)
```

```
page_rank_vector = 6×1
    0.2646
    0.1383
    0.1502
    0.1097
    0.1871
    0.1502
```

After applying the **Dampning:**

```
a = 0.85;
n = 1/length(page_rank_vector);
p =  a* page_rank_vector + (1-a)*n;
disp(p)
```

```
    0.2499
    0.1425
    0.1527
    0.1182
    0.1841
    0.1527
```

The rankings are as follows:

1. A
2. E
3. C
4. F
5. B
6. D