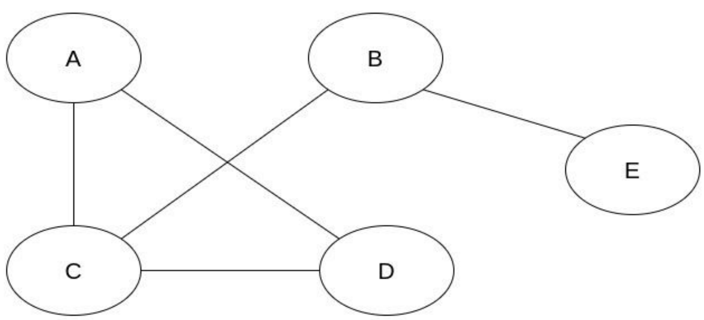
Thursday Quiz - Rubrics

1. [1 point] Let x and y be 2 eigen-vectors of the adjacency matrix of a graph where Eigenvectors are real and orthogonal. Let **dot_product** be the dot product of x and y . What is the value of **dot_product** ?
    a. 0
    b. > 0
    c. < 0
    d. None of the above
2. [1+1 points] What do you mean by **Trawling**? Define the complete bipartite subgraphs K(s,t).
    Trawling is searching for small communities in web graphs. [1 point]
    K(s,t) is a complete bipartite subgraph where, having s nodes (on the left) each linking to each of the t nodes(on the right). [1 point]

3. [1 points] Name two approaches to divide a graph into k clusters using spectral clustering.
    Recursive bi-partitioning [0.5 points]
    Cluster multiple eigen-vectors [0.5 points]
4. [3 points] For the following graph, write down the Adjacency matrix, Degree matrix and the Laplacian matrix. Assume the order of the rows and columns is alphabetical, i.e. first row and column in A, second is B and so on. Write each row as [1,2,3,4,5].

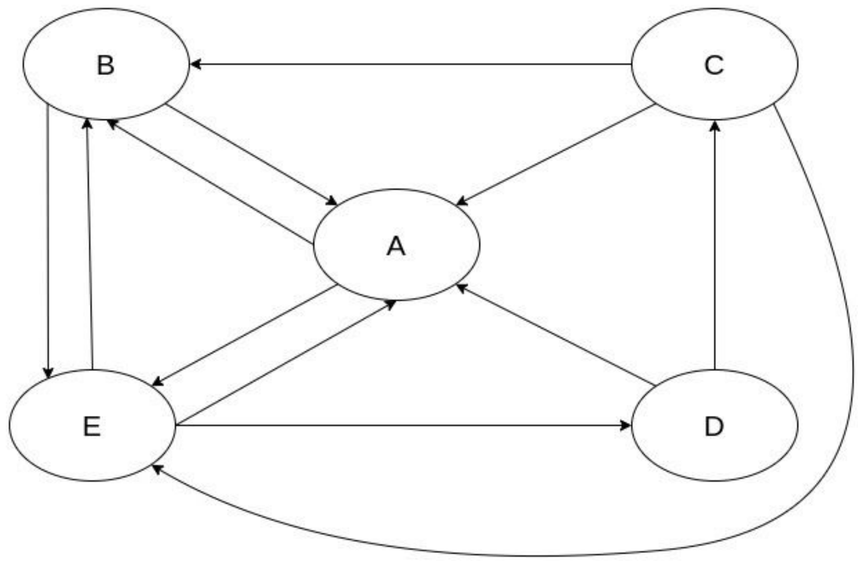


Adjacency Matrix [1 point]
[0, 0, 1, 1, 0]
[0, 0, 1, 0, 1]
[1, 1, 0, 1, 0]
[1, 0, 1, 0, 0]
[0, 1, 0, 0, 0]

Degree Matrix [1 point]
[2, 0, 0, 0, 0]
[0, 2, 0, 0, 0]
[0, 0, 3, 0, 0]
[0, 0, 0, 2, 0]
[0, 0, 0, 0, 1]

Laplacian Matrix [1 point]
[2, 0, -1, -1, 0]
[0, 2, -1, 0, -1]
[-1, -1, 3, -1, 0]
[-1, 0, -1, 2, 0]
[0, -1, 0, 0, 1]

5. [1+2 points] Trawling: with a support threshold = 2, find one **K(s,t=2)** bipartite sub-graph from the graph below (2 points). You need to first convert the graph to a market basket model (i.e., write down baskets and their contents) (1 point). The bipartite subgraph K(s,t) should be represented as follows: s -> {m, n} ; t -> {p, q}



Market Basket model: [1 point]
a- > {b, e}
b -> {a, e}
c- > {a, b, e}
d- > {a, c}
e- > {a, b, d}

The K(s,2) bipartite subgraphs is:
S -> {b, c} [1 point]
T -> {a, e} [1 point]

OR

S -> {c, e} [1 point]
T -> {a, b} [1 point]

OR

S -> {a, c} [1 point]
T -> {b, e} [1 point]