Data Structure and Algorithms

Lab9

Submitted to:	**Ms. Sehar Waqar**
Submitted by:	**SABA**
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Department of Computer Engineering

UET,Lahore

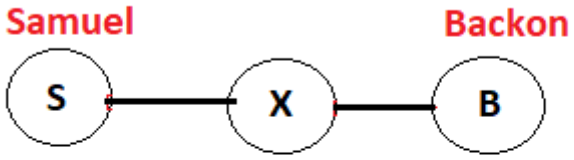
Pre-lecture Exercise:

Question 1:

Among actors, a “Bacon number" is the number of degrees of separation from an actor to Kevin Bacon. For example, Kevin Bacon’s Bacon number is 0. If an actor works in a movie with Kevin Bacon, the actor’s Bacon number is 1. If an actor A works with an actor B who worked with Kevin Bacon in a movie, then actor A’s Bacon number is 2, and so forth.

(a) What is Samuel L. Jackson’s Bacon number?

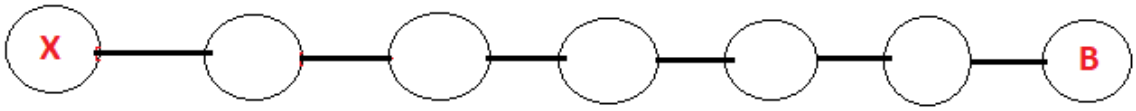
Answer: We can represent actors (Samuel L. Jackson, Kevin Bacon, X, Y etc) with vertices and connection among them with edges. Samuel L. Jackson’s Bacon number is equal to the number of edges in an undirected graph that covers path from Samuel to Bacon.



No of edges fom S to B = 2
Samel Bacon Number = 2

(b) List all the people with Bacon number equal to 6.

Answer: All the people with the number of edges equals 6 from his/her to Bacon in an undirected graph has Bacon number equal to 6.



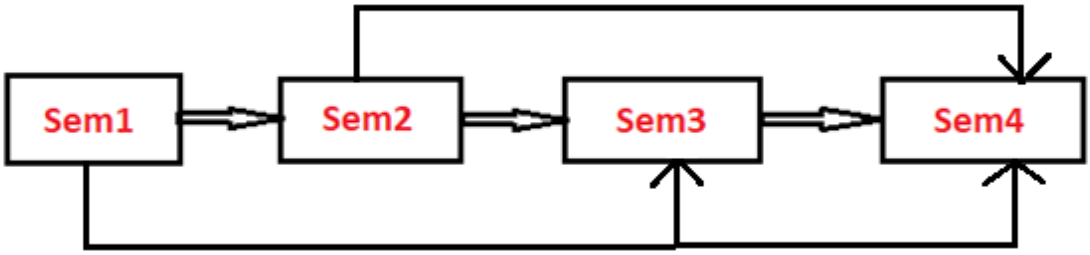
Number of edges from X to B = 6
X's Bacon number = 6

Question 2:

You need to take a bunch of classes at Stanford, and some of them depend on each other.For example, you must take CS 103 before taking CS 161. Given a set of classes you need to take, and information about which class is a pre-requisite for which other class, generate an order in which to take all of the classes. Assume you can only take one class at a time.

Answer: This problem is solved by directed graph.

- Sem1 is pre-requisite of Sem2, Sem3, Sem4.
- Sem2 is pre-requisite of Sem3, Sem4.
- Sem3 is pre-requisite of Sem4.



Question 3:

You are about to purchase a bunch of fish. You have two very large fish tanks. Unfortunately, some of these species of fish will fight if they are put in the same tank. For each pair of species, you know whether they will fight or whether they will peacefully co-exist. Find a way to separate the fish into two peaceful fish tanks if it exists.

Answer: We can use BFS but instead of using one queue we can use two queues to store fishes separately.

Homework Question:

Question 2:

(a) Run DFS starting at vertex C, breaking any ties by alphabetical order.

a. What do you get when you order the vertices by ascending start time?

Answer: C, D, E, A, B

b. What do you get when you order the vertices by descending finish time?

Answer: A, B, C, D, E

(b) Run DFS starting at vertex C, breaking any ties by reverse alphabetical order.

a. What do you get when you order the vertices by ascending start time?

Answer: C, E, D, B, A

b. What do you get when you order the vertices by descending finish time?

Answer: A, B, C, D, E