Assignment #03

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Subject :

Graph Theory

Department :

Mathematics

Ch# 4

Case Studies

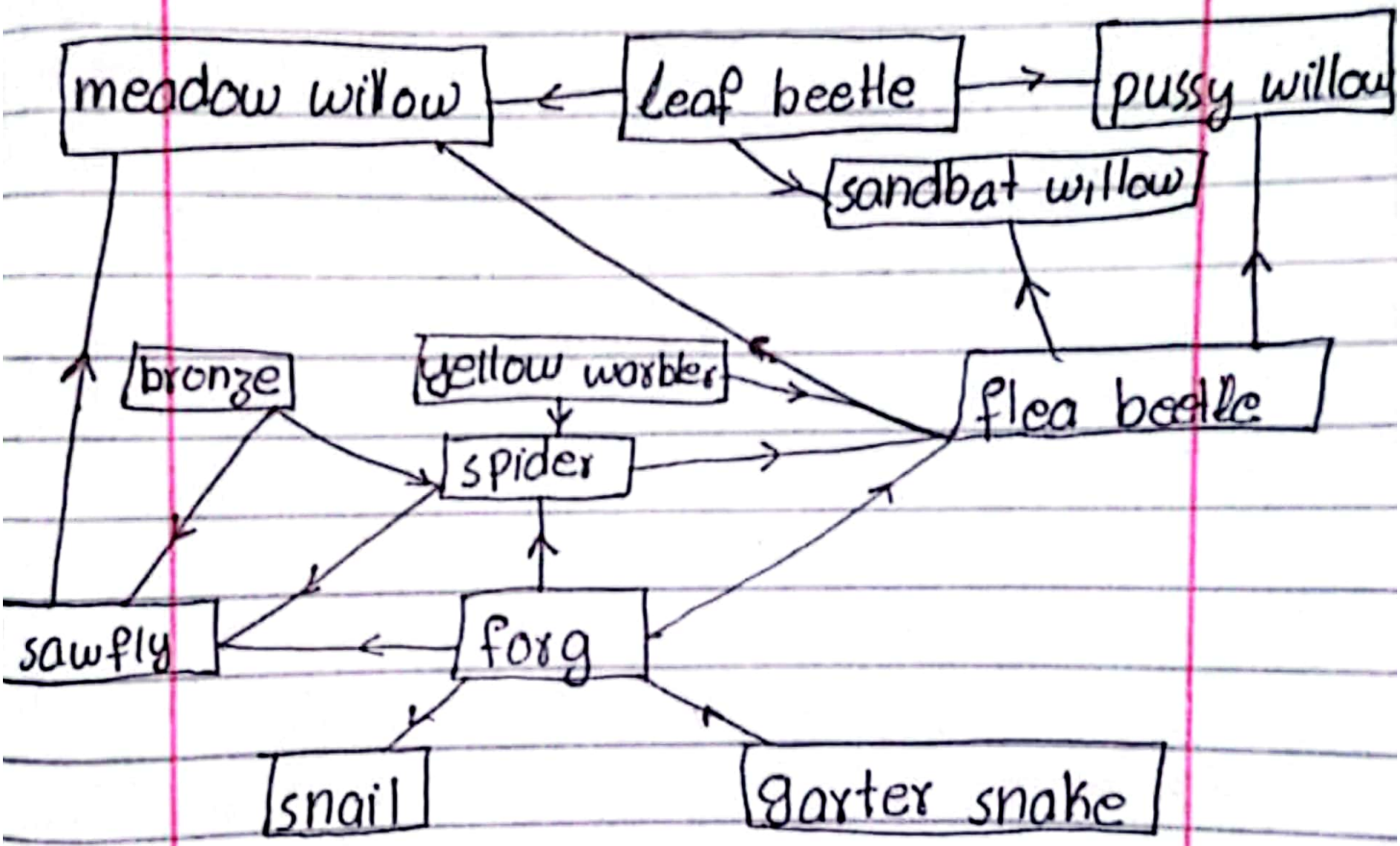
We conclude this chapter with four case studies - ecology, social Network, the rotating drum problem (Involving Eulerian digraphs) and tournaments (Involving Hamiltonian digraphs).

Ecology:

Snakes eat frogs, and birds eat spiders; birds and spiders both eat insects; frogs eat snails, spiders and insects. Given any such tangle of interrelationships between predator and prey, how do ecologists sort out the overall predatory behaviour of the various species they are investigating

When studying relationships between animals and plants and their environment, ecologists some time use a digraph known as a food web. A such a digraph, the vertices correspond to the species B whenere A preys on B.

As an example of a food web consider the following digraph, which represents the predatory habits of organisms in a canadian willow forest.

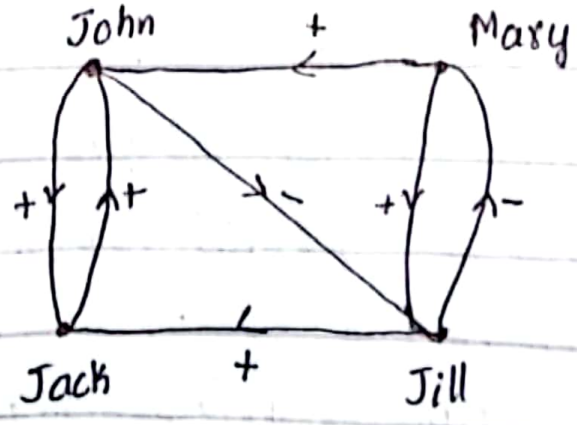


In untangling such food webs, ecologists introduce a graph that tells them which species complete for food This graph is know as the competition graph or niche overlap graph, and its edges join pairs of vertices representing species that share a common prey.

Social Networks:-

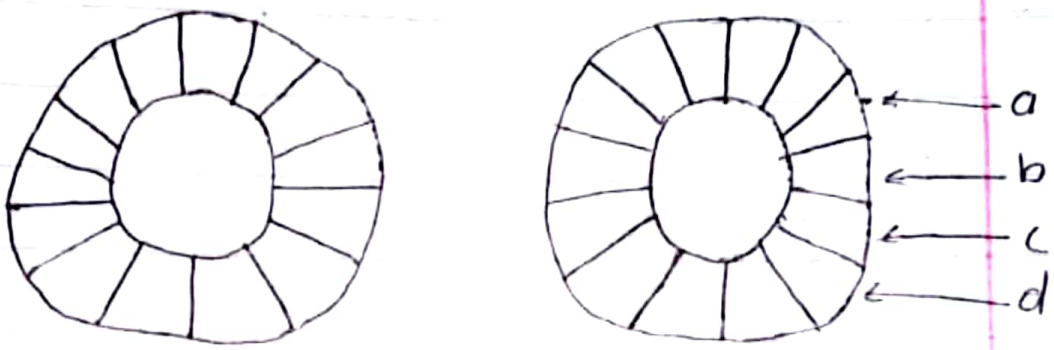
we described the use of signed graphs to represent symmetric relationships. When some relationships are not symmetric, we use a signed digraph. This is a digraph with either + or − associated with each arc, indicating a positive relationship or a negative one.

For Example, in the signed digraph below, John and Jack like each other, Mary likes Jill but Jill dislike Mary, John dislikes Jill but we have no information about Jill's feelings for John, and so on.



Rotating :: Drum :: Problem.

A problem that has arisen in telecommunications is the rotating drum problem or teleprinter's Problem.



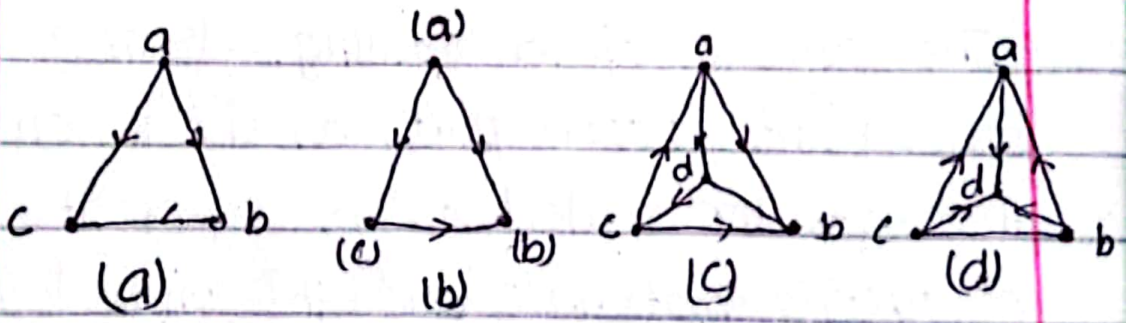
. The surface of a rotating drum is divided into sixteen parts, as shown on the left, the shaded areas represent conducting materials and the unshaded areas represent non-conducting materials we represent the position of the drum by four binary digits a, b, c and d, as indicated on the right Depending on the position of the drum, the terminals are a, c and d. The earth.

Ranking in Tournaments:

We conclude this chapter with an application of Hamiltonian digraphs that arises in statistics.

A tournment is a digraph whose underlying graph is a complete graph.

For Example, the following diagram shows tournaments with 3 and 4 vertices:



Such a digraph can be used to record the winners in a round-robin tournament in which each player plays each of the other. for Example.

In tournament (a), a beats both b and c, and b beats c;

In tournament, c beats a, d and b; b beats a and d; and a beats d.