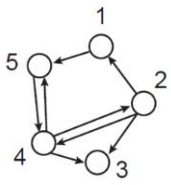
# Assignment Report

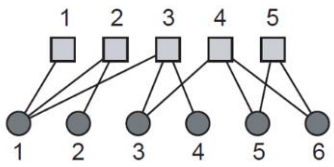
Problem 1:

| | |
|---|---|
| (a) | **acyclic directed network**: **food webs**<br>Data can be collected from vary biology books.<br>Phenomenon: Which animal impacts mostly if it were extinct. |
| (b) | **cyclic directed network**: **friendship**<br>Data can be collected by questionnaire survey.<br>Phenomenon: Who might be the most potential leader to approach the proposal. |
| (c) | **the tree**: **family tree**<br>Data can be gathered from the Household Registration Office.<br>Phenomenon: Who might suffer from the genetic disease. |
| (d) | **planar network**: **electric circuit**<br>The circuit can be recorded by hands randomly.<br>Phenomenon: Which edge if taken might not affect the whole electric circuit. |
| (e) | **bipartite network**: **clubs students attending**<br>Data can be collected from the questionnaire survey.<br>Phenomenon: Whether the higher possibility of students attending the similar |
| (f) | **temporal network**: **contact of a person**<br>The information can be gathered from the data of social network or cellphone.<br>Phenomenon: Who has the most frequent contacting with the recipient. |

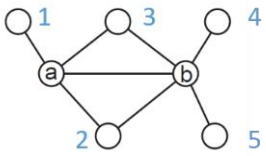
Problem 2:



(A)



(B)



(C)

(a)

| A | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 1 |
| 2 | 1 | 0 | 1 | 1 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 1 | 1 | 0 | 1 |
| 5 | 0 | 0 | 0 | 1 | 0 |

(b)

| A | |
|---|---|
| 1 | { (5,1) } |
| 2 | { (1,1) , (3,1) , (4,1) } |
| 3 | { } |
| 4 | { (2,1) , (3,1) , (5,1) } |
| 5 | { (4,1) } |

(c)

| A | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 0 | 0 |
| 2 | 0 | 1 | 0 | 0 | 0 |
| 3 | 0 | 0 | 1 | 1 | 0 |
| 4 | 0 | 0 | 1 | 0 | 0 |
| 5 | 0 | 0 | 0 | 1 | 1 |
| 6 | 0 | 0 | 0 | 1 | 1 |

| A | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1 | 1 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 1 | 1 | 0 | 0 |
| 4 | 0 | 0 | 1 | 0 | 0 | 1 |
| 5 | 0 | 0 | 0 | 0 | 1 | 1 |

(d)

**cosine similarity**:

| C | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| a | 1 | 1 | 1 | 0 | 0 |
| b | 0 | 1 | 1 | 1 | 1 |

$$\text{cosine similarity} = \cos(\theta) = \frac{A \cdot B}{|A||B|}$$

A=(1,1,1,0,0) B=(0,1,1,1,1) cosine similarity:$\frac{\sqrt{3}}{3}$

Collaboration: TA 丁羅邦芸.