Communications and Transport Systems
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TNSL20 - basic logistic algorithms

Homework Set 2, 2017

Solutions for Questions 1 and 2 are due September 26, 2017. Solutiions for Questions 3,4,5 are due October 3, 2017.

Question 1 (Stable Matchings): Lena, Marie, Nora, Olivia, Gustav, Herbert, Jan, and Karl have the following preferences:

Gustav	Lena	Nora	Marie	Olivia
Herbert	Nora	Lena	Marie	Olivia
Jan	Nora	Marie	Olivia	Lena
Karl	Lena	Olivia	Nora	Marie

Lena	Gustav	Herbert	Jan	Karl
Marie	Jan	Gustav	Herbert	Karl
Nora	Gustav	Jan	Karl	Hervert
Olivia	Herbert	Jan	Karl	Gustav

(a) Use the algorithm from the lecture, with the women proposing, to come up with a stable matching. Write down all your steps

(b) Marie suggested the following matching: Gustav is paired with Nora, Herbert is paired with Lena, Jan is paired with Marie, and Karl is paired with Olivia. Is this a stable matching?

Question 2 (FOR loops): Consider the following small algorithm:
$k = 0$
FOR $n = 1$ **TO** 10
    k=k+1

What is the value of k after running this algorithm?

Question 3 (Adjacency matrices): For graphs G_1 and G_2 write a matrix E, such that each row contains the vertices of an edge. Use this matrix to creat the adjacency matrix A.
As an example, E for G_1 is the following:

$$E = \begin{bmatrix} 1 & 2 \\ 1 & 3 \\ 3 & 4 \\ 2 & 4 \\ 2 & 3 \end{bmatrix}$$

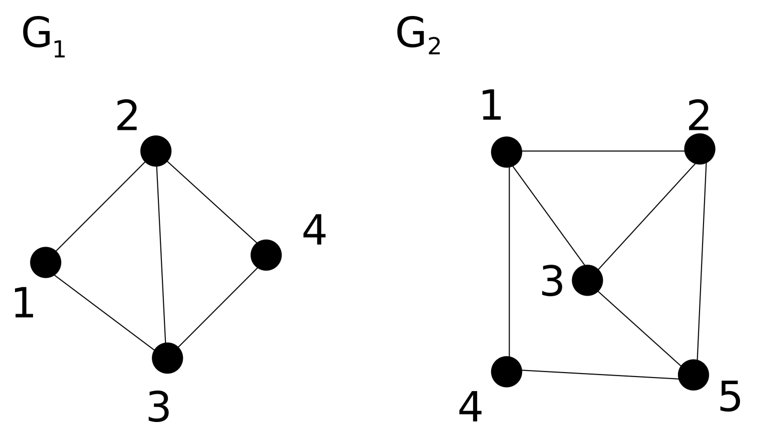

Figure 1: Graphs G_1 and G_2.

Question 4 (Greatest common divisor): Implement the algorithm that compute the greatest common divisor of two integers from the lecture in matlab. As a reminder, the Pseudocode:

function gcd(a, b)
  WHILE $a \neq b$
    IF $a > b$
      $a := a - b;$
    ELSE
      $b := b - a;$
  return a;

Question 5 (Second order algebraic equations):
Given the second order algebraic equation:

$$ax^2 + bx + c = 0$$

The solution (roots) is as follows:

$$x = \begin{cases} \frac{-b \pm \sqrt{b^2-4ac}}{2a} & a \neq 0 \\ -\frac{c}{b} & a = 0, b \neq 0 \\ \textsf{No solution} & a = 0, b = 0, c \neq 0 \\ \textsf{Any number} & a = 0, b = 0, c = 0 \end{cases}$$

Write a script which solves second order algebraic equation for any given a, b and c.