MA0301
ELEMENTARY DISCRETE MATHEMATICS
NTNU, SPRING 2022

Set 9

Deadline: Monday 21.03.2022, 23:59

Translations for some relevant terms: Vertex - hjørne; edge - kant; path - vei; cycle - sykel; circuit - krets; adjacency matrix – naboforholdsmatrise.

Exercise 1. *Use the following adjacency martices to draw the indicated graph. (Note: the definition of an adjacency matrix can be found at the end of this week's lecture notes)*

a. The directed graph associated with:

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

b. The undirected graph associated with:

$$\begin{bmatrix} 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Exercise 2. *This exercise builds on Lewis, Zax: 16.2. Let $G = (V_G, E_G)$ be the graph depicted in Figure 16.21 on page 171 of the textbook. Recall that an Euler path is a path that uses each edge in the graph exactly once.*

(1) Explain why $G - \{\{A, E\}\}$ must have an Euler path and find one.

(2) Consider $G - X := (V_G, E_G - X)$ where $X \subseteq E_G$. Which sets $X = \{e, f\}$ for $e, f \in E_G$ are possible if you require that $G - \{e, f\}$ be connected and have an Euler path?

(3) Which sets $X = \{e, f, g\}$ for edges $e, f, g \in E_G$ are possible if we require $G - \{e, f, g\}$ to be connected and have an Euler circuit?

Exercise 3. *Lewis, Zax: Exercise 16.7.*

Exercise 4. *Lewis, Zax: Exercise 16.10.*

Exercise 5. *Lewis, Zax: Exercise 16.8.*

Exercise 6. *Lewis, Zax: Exercise 16.9.*

Date: March 15, 2022.