

Question 1 (true/false section)

- a) Network production is low only when the system is jammed.
- b) Perimeter control cannot restrict vehicle flows differently based on their destination.
- c) Without tolling, the solution for the system optimum and Wardrop equilibrium will never be the same.

Question 2

- 1) In lab 1, the clustering of urban networks into regions was investigated. Answer the following questions about clustering:

- a) What are the aims of clustering?
- b) How can we quantify and compare different clustering results?
- c) What are the advantages that clustering provides to traffic modeling and traffic management?

- 2) Macroscopic Fundamental Diagrams

- a) What are the advantages of utilizing MFD in modeling and control of large-scale congested networks?
- b) What type of data and sensors would one need to estimate a multimodal MFD for a city that has both cars and buses.

Question 3

Compute the Wardrop Equilibrium for a network with three parallel links, let $\lambda = 1$, $d_1(f_1) = f_1$, $d_2(f_2) = 1$ and $d_3(f_3) = 2$.