

No calculator allowed.

Write to each of your answering sheets

- course name, date, number of the sheet / total number of the sheets
- family name, given name, student id, signature

You can answer either in English or in Finnish. You are permitted to take this problem sheet with you when you leave the exam.

1. a) How can fractal dimension be defined? (2p)
b) Define the Cantor set and derive its fractal dimension (4p)

2. Explain briefly the following:
 - a) Attractor basin in a Boolean network (2p)
 - b) Bifurcation diagram (2p)
 - c) Evolutionarily stable strategy (ESS) (2p)

3. a) What is the payoff matrix in the case of Prisoner's dilemma? (2p)
b) What is the optimal strategy in a one-off game? Why? (2p)
c) How can the situation change in repeated games and why is this of general interest? (3p)

4. a) How is Normalized Compression Distance (NCD) between strings x and y computed? (3p)
b) In the analysis of Boolean network dynamics, so called Derrida curves are plotted. What is shown in such a plot and what can this information be used for? (3p)

5. a) What is the Yule process in the context of power laws? (3p)
b) How is this related to the network growth model presented by Albert and Barabasi? What kinds of networks result from this growth model? (3p)