Exercise 11.1 (Continuous Endpoint Class, 5 marks)

(a) State four elements of $C$ which are no base relations of Allen’s interval calculus. Prove that they really are contained in $C$. (Do not use the examples from the lecture slides.)

(b) Show that $C$ is closed under intersection and converse.

(c) Show that $C$ is not closed under union.

You may use without proof that $C$ is a proper subset of Allen’s interval calculus $A$.

(d) Prove that $C$ is not closed under complement.

*Hint:* Use parts (b) and (c).

Exercise 11.2 (RCC-5, 5 marks)

In the lecture we introduced Allen’s interval calculus for *temporal* reasoning. Another interesting application of qualitative reasoning is *spatial* reasoning which addresses qualitative relationships between regions in space. A common spatial calculus is the RCC-8\(^1\), which has 8 base relations. Here, we consider the slightly simpler RCC-5 with the following 5 base relations (the difference to RCC-8 is that interior and border points are not distinguished):

- **XEQ** $X$ is equal to $Y$.
- **XDC** $X$ and $Y$ do not share any point (disconnected).
- **XPO** $X$ and $Y$ share points but none of the regions is completely contained in the other (partial overlap).
- **XPP** $X$ is a proper subregion of $Y$ (proper part).
- **XPP\(^{-1}\)** $Y$ is a proper subregion of $X$.

State the composition table for RCC-5 (no proofs are necessary).

\(^1\)http://en.wikipedia.org/wiki/Region_Connection_Calculus