Quantitative Verification – Exercise sheet 3

Exercise 3.1
Compute the set of reachable states in the TA shown in figure 1.

Exercise 3.2
Draw the region automaton for the TA shown in figure 2.

Exercise 3.3
Draw the zone automaton for the TA shown in figure 3.
Solution 3.1
Set of reachable states = \{s_1, s_2, s_3, s_4, s_5\}

Solution 3.2

- We have \( C_x = C_y = 1 \). Hence, we have the following regions

1. \( x = y = 0 \)
2. \( x = y \in (0, 1) \)
3. \( x = y = 1 \)
4. \( x = 0, y \in (0, 1) \)
5. \( x = 0, y = 1 \)
6. \( x \in (0, 1), y = 0 \)
7. \( x = 1, y = 0 \)
8. \( x \in (0, 1), y = 1 \)
9. \( x = 1, y \in (0, 1) \)
10. \( x > 1, y = 0 \)
11. \( x > 1, y \in (0, 1) \)
12. \( x > 1, y = 1 \)
13. \( x = 0, y > 1 \)
14. \( x \in (0, 1), y > 1 \)
15. \( x = 1, y > 1 \)
16. \( x > 1, y > 1 \)
17. \( x > y, x, y \in (0, 1) \)
18. \( x < y, x, y \in (0, 1) \)

The region automaton is showed in figure 4. Delay transitions are dashed, transitive delay transitions and delay self-loops on states with regions 11, 14, 16, 17 and 18 are omitted for readability.

Solution 3.3

The zone automaton is showed in figure .
Figure 4: Region automaton
Figure 5: Zone automaton