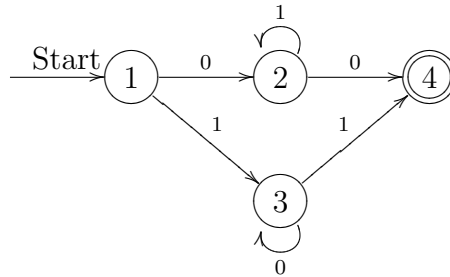


# COSC/MATH 4P61 - Theory of Computation

## Term Test 1

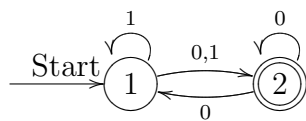
**Question 1: (10 marks)** Find a regular expression  $R$  so that  $L(R) = L(D)$  where  $D$  is the following DFA:



**Solution:**

$$\begin{aligned} R &= R_{14}^{(4)} \\ &= R_{14}^{(3)} + R_{14}^{(3)}(R_{44}^{(3)})^*R_{44}^{(3)} \\ &= R_{14}^{(3)} + R_{14}^{(3)}(\emptyset)^*\emptyset \\ &= R_{14}^{(3)} \\ &= R_{14}^{(2)} + R_{13}^{(2)}(R_{33}^{(2)})^*R_{34}^{(2)} \\ &= R_{14}^{(2)} + 10^*1 \\ &= R_{14}^{(1)} + R_{12}^{(1)}(R_{22}^{(1)})^*R_{24}^{(1)} + 10^*1 \\ &= \emptyset + 01^*0 + 10^*1 \\ &= 01^*0 + 10^*1 \end{aligned}$$

**Question 2: (10 marks)** Construct a DFA  $A$  so that  $L(A) = L(N)$  where  $N$  is the following NFA:



**Solution:**

$\delta$	0	1
{1}	{2}	{1, 2}
{2}	{1, 2}	$\emptyset$
{1, 2}	{1, 2}	{1, 2}
$\emptyset$	$\emptyset$	$\emptyset$

