EECS20n, Quiz 2, 02/09/04, Solution

Consider the 'bubble and arcs' diagram of Figure 1.

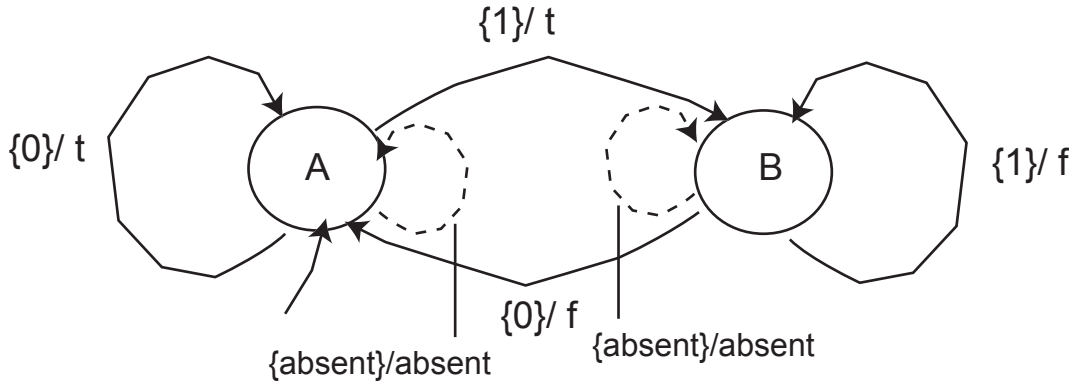

Figure 1: State machine

1. Add arcs corresponding to the input *absent* to Figure 1. These arcs are shown as dashed lines.

2. For the state machine, what are:

$$\textit{States} = \boxed{\{A, B\}} \quad \textit{Inputs} = \boxed{\{0, 1, \textit{absent}\}} \quad \textit{Outputs} = \boxed{\{t, f, \textit{absent}\}} \quad \textit{initialState} = \boxed{A}$$

$$\textit{InputSignals} = \boxed{[\textit{Nats}_0 \to \{0, 1, \textit{absent}\}]} \quad \textit{OutputSignals} = \boxed{[\textit{Nats}_0 \to \{t, f, \textit{absent}\}]}$$

3. For the input signal x shown below, write down the corresponding state respose s and output signal y.

$n =$	0	1	2	3	4	$\cdots$
$x =$	0	*absent*	0	1	1	$\cdots$
$s =$	A	A	A	A	B	$B \cdots$
$y =$	t	*absent*	t	t	f	$\cdots$

4. This state machine defines an input-output function F: *InputSignals* $\to$ *OutputSignals*. Write this function as the expression below:

$$\forall x \in [\textit{Nats}_0 \to \{0, 1\}], \forall n \in \textit{Nats}_0$$

$$F(x)(n) = \begin{cases} t, & n = 0 \\ t, & n > 0 \wedge x(n-1) = 0 \\ f, & n > 0 \wedge x(n-1) = 1 \end{cases}$$