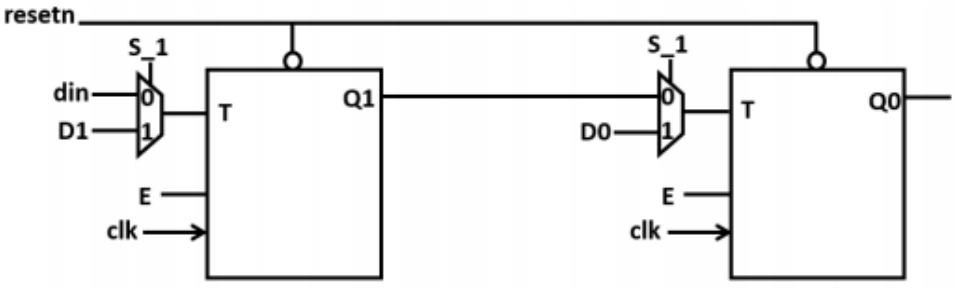
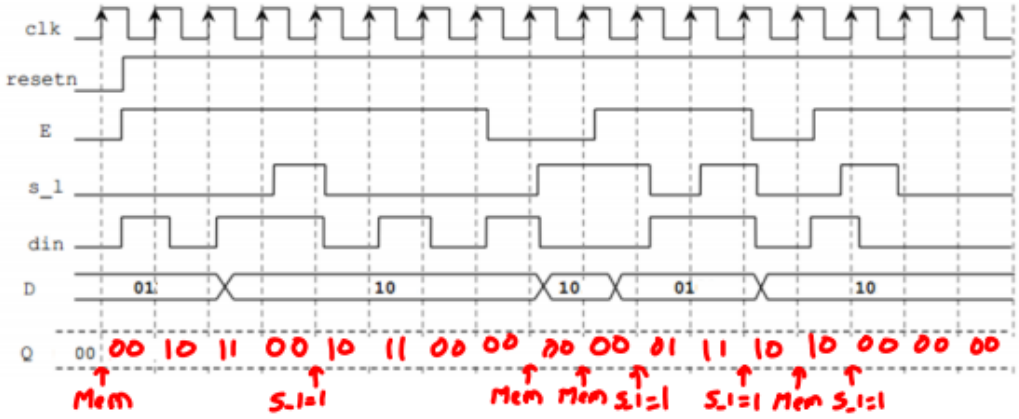
Digital Circuits Quiz-3 (29th October, 2018)

Time: 40 minutes

1. Consider the following circuit consisting of two T-FFs (toggle Flip-flops) with memory (when T=0) and toggle (when T=1) states. When E=0, T-FFs goes into memory state irrespective of value of input T. Complete the timing diagram where D={D1,D0} and Q={Q1,Q0}.





2(a)

$Q1(t+1) = Q2(t) \oplus Q3(t)$
$Q2(t+1) = Q1(t)$
$Q3(t+1) = Q2(t)$

2(b)

$\boldsymbol{S(1)} = \{\mathbf{1},\mathbf{0},\mathbf{0}\}$
$\boldsymbol{S(2)} = \{\mathbf{0},\mathbf{1},\mathbf{0}\}$
$S(3) = \{1,0,1\}$
$\boldsymbol{S(4)} = \{\mathbf{1},\mathbf{1},\mathbf{0}\}$
$S(5) = \{1,1,1\}$
$\boldsymbol{S(6)} = \{\mathbf{0},\mathbf{1},\mathbf{1}\}$
$\boldsymbol{S(7)} = \{\mathbf{0},\mathbf{0},\mathbf{1}\}$
$S(8) = \{1,0,0\}$
….
Repetition occurs such that $S(0) = S(7), S(1) = S(8)$ and so on.
The output at clock cycle t is same as $t\%7$ $(modulus\ of\ 7)$.

$\boldsymbol{S(100) = S(100\%7) = S(2) = \{0,1,0\}}$
$\boldsymbol{S(1000) = S(1000\%7) = S(6) = \{0,1,1\}}$