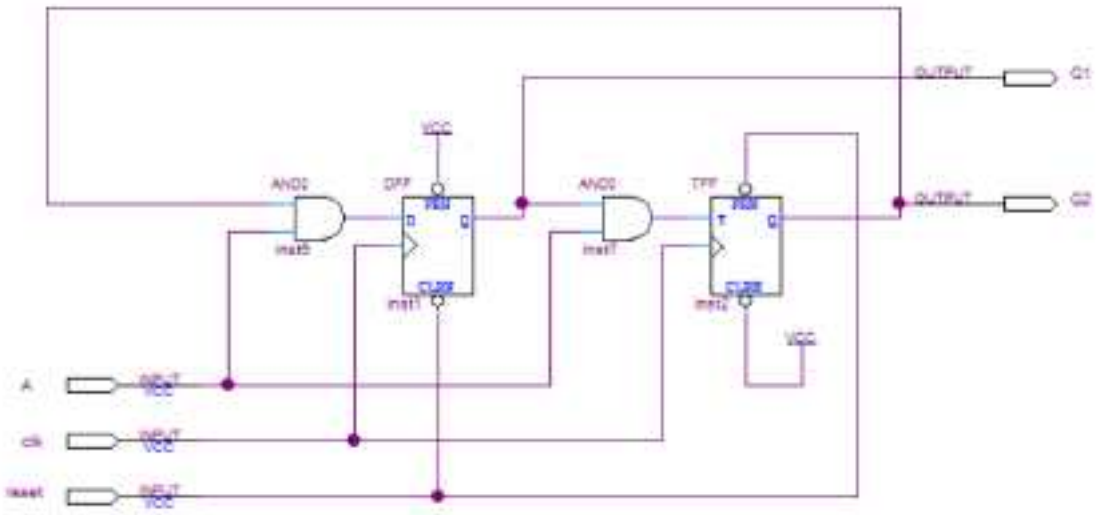
Biestables T

Problem 1 (from Second Term exam, 2015)

Given the following circuit:



a) Get the expressions of the state functions D and T.
b) Get the transition table of the circuit (use Q1 as MSB and Q2 as LSB).
c) Complete the following chronogram (the state value is represented as unsigned integer, with Q1 as the MSB and Q2 as the LSB).

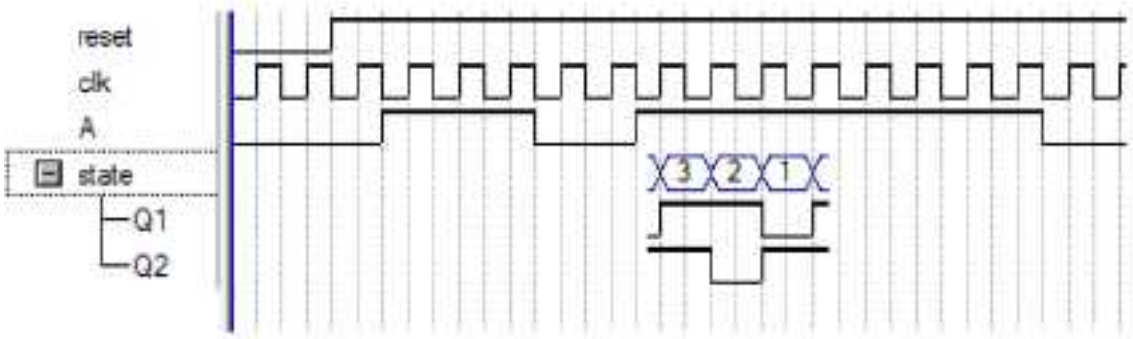


Fig. 1.1

SOLUTION

Question 1: (2,5 points)

a) State functions → (0,15 points)

$D = A \cdot Q_2$

$T = A \cdot Q_1$

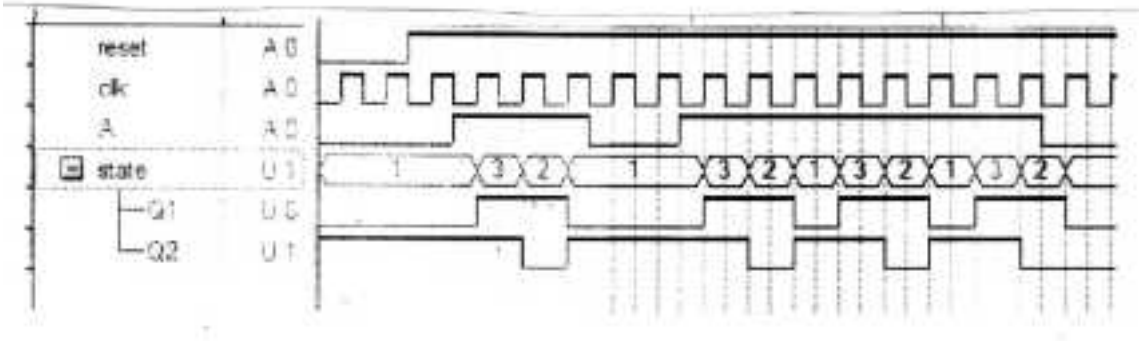
b) Transition table → Looking at the state functions and knowing the flip-flop behaviours (0,75 points)

A	Q_1	Q_2	Q_1'	Q_2'	D	T
0	0	0	0	0	0	0
0	0	1	0	1	0	0
0	1	0	0	0	0	0
0	1	1	0	1	0	0
1	0	0	0	0	0	0
1	0	1	1	1	1	0
1	1	0	0	1	0	1
1	1	1	1	0	1	1

or

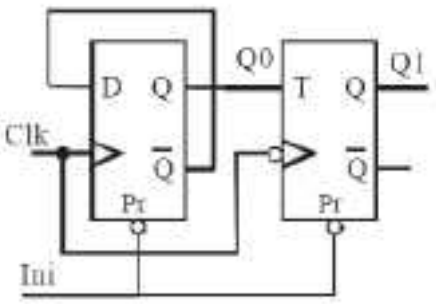
Q_1	Q_2	A	Q_1'	Q_2'	D	T
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	0	0
0	1	1	1	1	1	0
1	0	0	0	0	0	0
1	0	1	0	1	0	1
1	1	0	0	1	0	0
1	1	1	1	0	1	1

c)



Problem 2:

Complete the following chronogram. Indicate the situations in which the output signals are undefined:



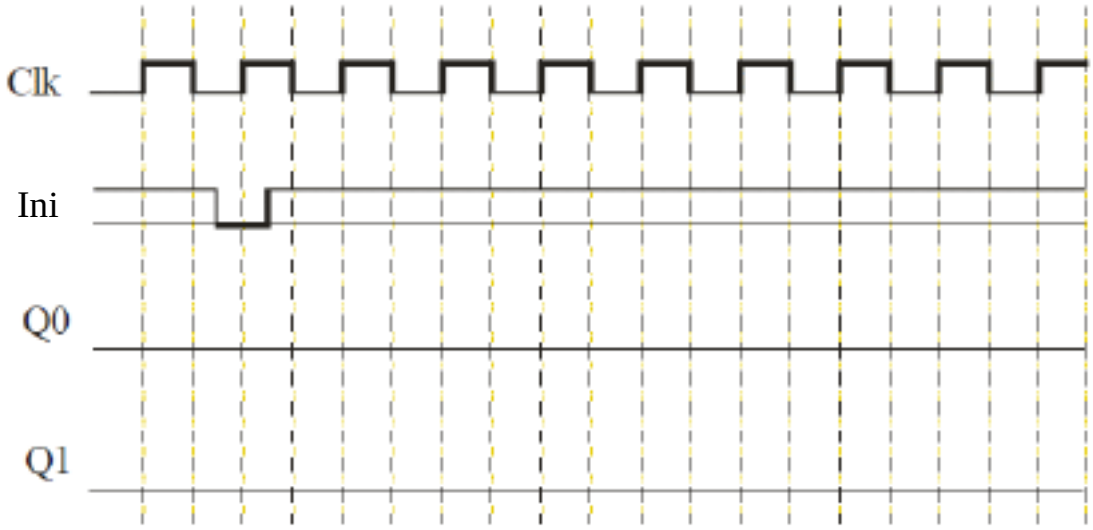
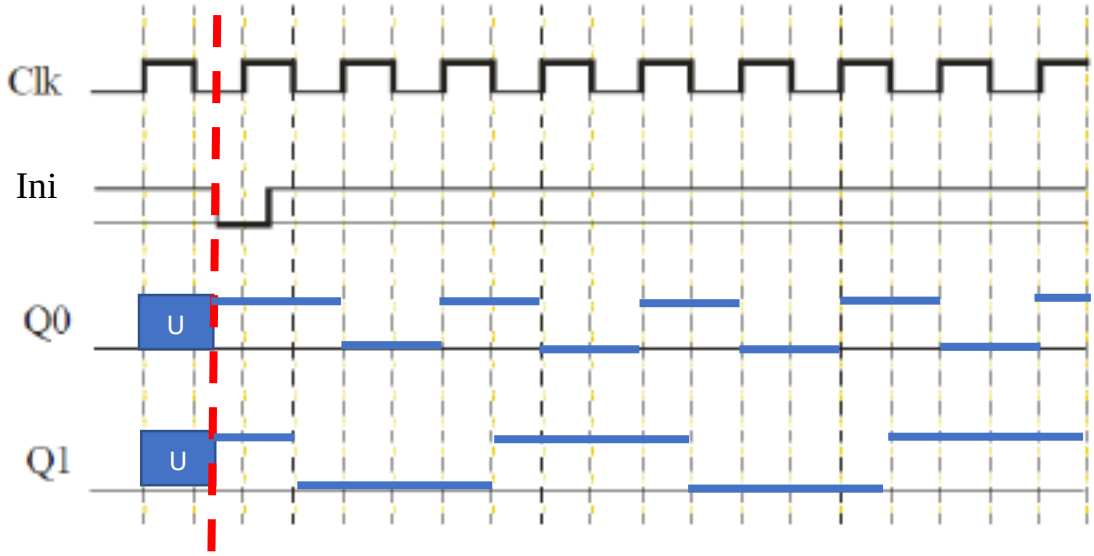


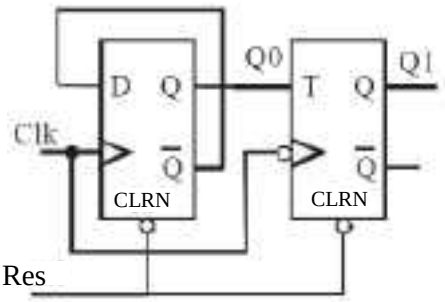
Fig 1.2

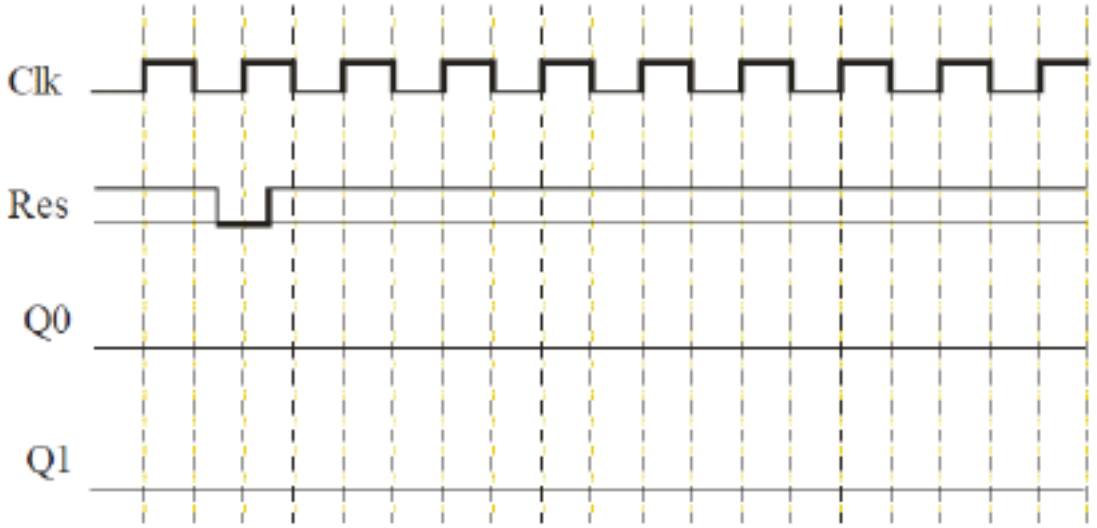
SOLUTION



Problem 3:

Complete the following chronogram. Indicate the situations in which the output signals are undefined.





SOLUTION