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Istanbul Technical University

Department of Computer Engineering

BLG 231E - Digital Circuits

Assignment 5 Solution

1. Since the output Z depends only on the state variables and, the circuit is designed using the Moore model.

Input of Q_1:

Q_1Q_0 \ X	0	1
00	0	0
01	1	1
10	0	0
11	1	1

Inputs of Q_0:

Q_1Q_0 \ X	0	1
00	00	10
01	10	01
10	10	01
11	01	11

State/output table:

Q_1Q_0 \ X	$Q_1^+Q_0^+$ 0	$Q_1^+Q_0^+$ 1	Z
00	00	01	0
01	11	10	1
10	11	10	1
11	00	00	0

2.
For the State $Q_1Q_0 = 11$ and $X=1$:
$T=1$ because T is connected to Q_0.
$JK=11$ because $1+1+1=11$ (binary addition).

Since $T=1$, Q_1 will toggle. Hence, $Q_1^+ = 0$.
Since $JK=1$, Q_0 will also toggle. Hence, $Q_0^+ = 0$.
Therefore $Q_1^+Q_0^+ = 00$.

3.
State diagram: