***Sequential Circuit***

1.    1. Design a 3 bit sequential circuit using T flip flops and one input X. When X = 0 the state of the circuit remains the same. When X = 1 the circuit goes through state transition from 0 -> 6 -> 2 -> 3 -> 5 -> 0. Make the sate table, state equation and state diagram.

Q(t+1) = T⊕Q = T’Q + TQ’

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | A(t) | B(t) | C(t) | TA | TB | TC | A(t+1) | B(t+1) | C(t+1) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
|  |  |  |  |  |  |  |  |  |  |

A(t+1) = TA ⊕ A(t)

TA = XA + XB’ + XC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| XA | BC |  |  |  |
|  | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | 0 |
| 01 | 0 | 0 | 0 | 0 |
| 11 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 0 |

B(t+1) = TB ⊕ B(t)

TB = XB’C’ + XBC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| XA | BC |  |  |  |
|  | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | 0 |
| 01 | 0 | 0 | 0 | 0 |
| 11 | 1 | 0 | 1 | 0 |
| 10 | 1 | 0 | 1 | 0 |

C(t+1) = TC ⊕ C(t)

TC = XB’C + XA’BC’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| XA | BC |  |  |  |
|  | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | 0 |
| 01 | 0 | 0 | 0 | 0 |
| 11 | 0 | 1 | 0 | 0 |
| 10 | 0 | 1 | 0 | 1 |

0

1

0

1

0

1

0

1

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1

1

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0

1

1