Assignment -2

Name: Ilias Ahamad ID: 1611296042

0

0

1 1

1 1

0

0

State diagram of synchronous Sequential Circuit

The number of inputs = 1(X)

The number of state variable = 2 (A, B)

Clock wise input x = 1

Anti-clock wise input x = 0

**Sequential Circuit using D Flip-Flops**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Present State** | | **Inputs** | **Next State** | | **Flip-Flop Input** | |
|  |  |  |  |  | **Functions** | |
|  |  |  |  |  |  |  |
| **A** | **B** | **X** | **A** | **B** | **DA** | **DB** |
|  |  |  |  |  |  |  |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 |
|  |  |  |  |  |  |  |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 |
|  |  |  |  |  |  |  |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 |
|  |  |  |  |  |  |  |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 |
|  |  |  |  |  |  |  |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 |
|  |  |  |  |  |  |  |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 |
|  |  |  |  |  |  |  |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 |
|  |  |  |  |  |  |  |

**K map for DA**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A\BX** | **00** |  | **01** | **11** | **10** |
|  |  |  |  |  |  |
| **0** | 0 |  | 1 | 0 | 1 |
|  |  |  |  |  |  |
| **1** | 1 |  | 0 | 1 | 0 |
|  |  |  |  |  |  |
|  |  |  | | |  |

DA = AB’X’ + A’B’X + A’BX’ + ABX

**K map for DB**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** | **11** | **10** |
|  |  |  |  |  |
| **0** | 1 | 1 | 0 | 0 |
|  |  |  |  |  |
| **1** | 1 | 1 | 0 | 0 |
|  |  |  |  |  |
|  |  |  |  |  |

DB=B’

**Sequential Circuit using JK Flip-Flops:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Present State** | | **Inputs** | **Next State** | | **Flip-Flop Input Functions** | | | |
|  |  |  |  |  |  |  |  |  |
| **A** | **B** | **X** | **A** | **B** | **JA** | **KA** | **JB** | **KB** |
|  |  |  |  |  |  |  |  |  |
| 0 | 0 | 0 | 0 | 1 | 0 | X | 1 | X |
|  |  |  |  |  |  |  |  |  |
| 0 | 0 | 1 | 1 | 1 | 1 | X | 1 | X |
|  |  |  |  |  |  |  |  |  |
| 0 | 1 | 0 | 1 | 0 | 1 | X | X | 1 |
|  |  |  |  |  |  |  |  |  |
| 0 | 1 | 1 | 0 | 0 | 0 | X | X | 1 |
|  |  |  |  |  |  |  |  |  |
| 1 | 0 | 0 | 1 | 1 | X | 0 | 1 | X |
|  |  |  |  |  |  |  |  |  |
| 1 | 0 | 1 | 0 | 1 | X | 1 | 1 | X |
|  |  |  |  |  |  |  |  |  |
| 1 | 1 | 0 | 0 | 0 | X | 1 | X | 1 |
|  |  |  |  |  |  |  |  |  |
| 1 | 1 | 1 | 1 | 0 | X | 0 | X | 1 |
|  |  |  |  |  |  |  |  |  |

**K-Map**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** |  | **11** | **10** |
|  |  |  |  |  |  |
| **0** | 0 | 1 |  | 0 | 1 |
|  |  |  |  |  |  |
| **1** | X | X |  | X | X |
|  |  |  |  |  |  |
|  |  |  | |  |  |

JA = B’X + BX’

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** |  | **11** | **10** |
|  |  |  |  |  |  |
| **0** | X | X |  | X | X |
|  |  |  |  |  |  |
| **1** | 0 | 1 |  | 0 | 1 |
|  |  |  |  |  |  |
|  |  |  | |  |  |

KA = B’X + BX’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** | **11** | **10** |
|  |  |  |  |  |
| **0** | **1** | **1** | **X** | **X** |
|  |  |  |  |  |
| **1** | **1** | **1** | **X** | **X** |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** | **11** | **10** |
|  |  |  |  |  |
| **0** | X | X | 1 | 1 |
|  |  |  |  |  |
| **1** | X | X | 1 | 1 |
|  |  |  |  |  |
|  |  |  |  |  |

JB=1

KB=1

**Sequential Circuit using T Flip-Flops:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Present State** | | **Inputs** | **Next State** | | **Flip-Flop Input** | |
|  |  |  |  |  | **Functions** | |
|  |  |  |  |  |  |  |
| **A** | **B** | **X** | **A** | **B** | **TA** | **TB** |
|  |  |  |  |  |  |  |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 |
|  |  |  |  |  |  |  |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 |
|  |  |  |  |  |  |  |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 |
|  |  |  |  |  |  |  |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 |
|  |  |  |  |  |  |  |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 |
|  |  |  |  |  |  |  |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 |
|  |  |  |  |  |  |  |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 |
|  |  |  |  |  |  |  |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 |
|  |  |  |  |  |  |  |

**K-maps**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** |  | **11** | **10** |
|  |  |  |  |  |  |
| **0** | 0 | 1 |  | 0 | 1 |
|  |  |  |  |  |  |
| **1** | 0 | 1 |  | 0 | 1 |
|  |  |  |  |  |  |
|  |  |  | |  |  |

TA = B’X + BX’

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A\BX** | **00** | **01** | **11** | **10** |
|  |  |  |  |  |
| **0** | 1 | 1 | 1 | 1 |
|  |  |  |  |  |
| **1** | 1 | 1 | 1 | 1 |
|  |  |  |  |  |
|  |  |  |  |  |

TB=1