

МГТУ им. Н.Э. Баумана

Дисциплина “Архитектура ЭВМ”
Лабораторная работа №4 по теме “Исследование синхронных
счетчиков”

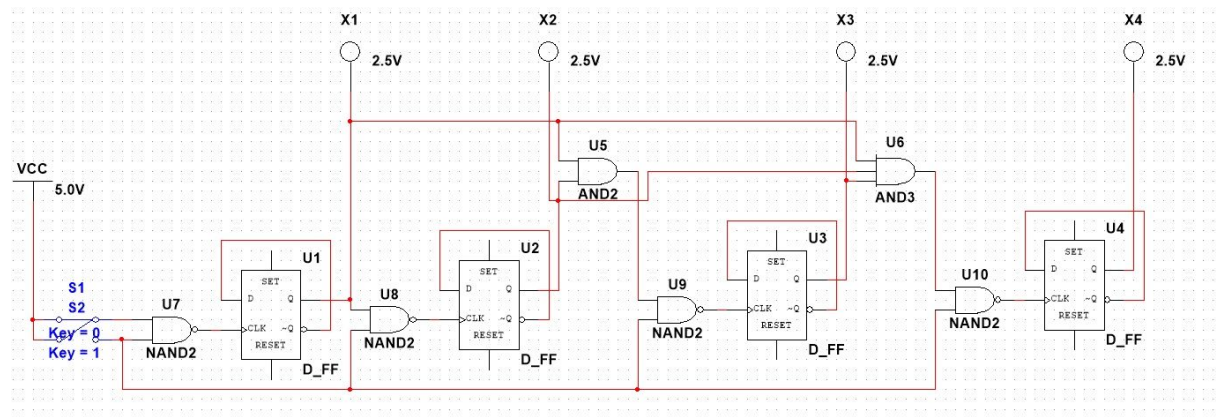
Работу выполнил:
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ИУ7-44Б

Цель работы – изучение принципов построения счетчиков, овладение методом синтеза синхронных счетчиков, экспериментальная оценка динамических параметров счетчиков, изучение способов наращивания разрядности синхронных счетчиков.

Задание 1

Четырехразрядный синхронный суммирующий счетчик с параллельным переносом на Т-триггерах



Задание 2

Вариант 9: 0,1,3,4,5,7,8,10,11,12

| Q3 | Q2 | Q1 | Q0 | Q3* | Q2* | Q1* | Q0* | J3 | K3 | J2 | K2 | J1 | K1 | J0 | K0 |
|----|----|----|----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | λ | 0 | λ | 0 | λ | 1 | λ |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | λ | 0 | λ | 1 | λ | λ | 0 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | λ | 1 | λ | λ | 1 | λ | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | λ | λ | 0 | 0 | λ | 1 | λ |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | λ | λ | 0 | 1 | λ | λ | 0 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | λ | λ | 1 | λ | 1 | λ | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | λ | 0 | 0 | λ | 1 | λ | 0 | λ |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | λ | 0 | 0 | λ | λ | 0 | 1 | λ |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | λ | 0 | 1 | λ | λ | 1 | λ | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | λ | 1 | λ | 1 | 0 | λ | 0 | λ |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

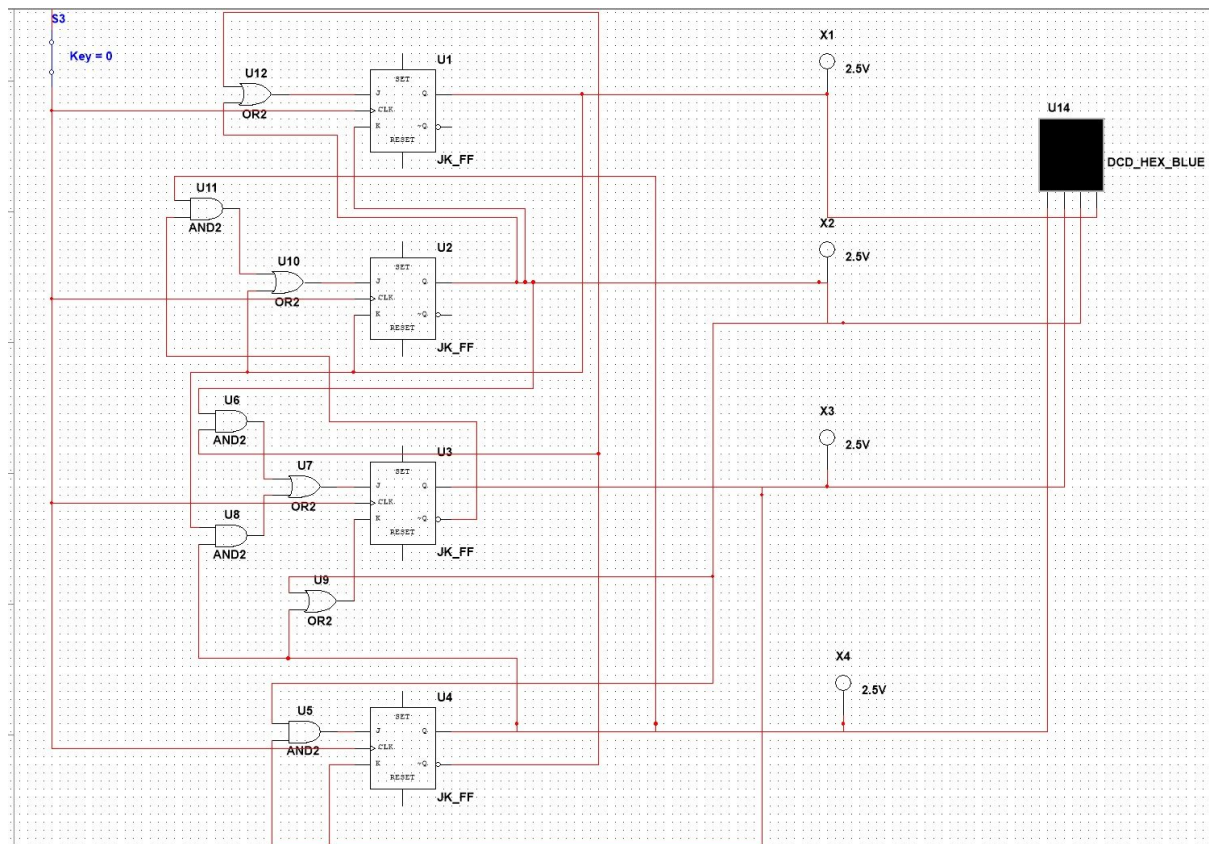
Минимизация

| J3=q1q2 | | | | | K3=q2 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | - | 00 | λ | λ | λ | - |
| 01 | 0 | 0 | 1 | - | 01 | λ | λ | λ | - |
| 11 | λ | - | - | - | 11 | 1 | - | - | - |
| 10 | λ | - | λ | λ | 10 | 0 | - | 0 | 0 |

| J2=q0q3 q1!q3 | | | | | K2=q1 q3 | | | | |
|-----------------|----|----|----|----|------------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 1 | - | 00 | λ | λ | λ | - |
| 01 | λ | λ | λ | - | 01 | 0 | 0 | 1 | - |
| 11 | λ | - | - | - | 11 | 1 | - | - | - |
| 10 | 0 | - | 1 | 0 | 10 | λ | - | λ | λ |

| J1=q0 !q2q3 | | | | | K1=q0 | | | | |
|---------------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 1 | λ | - | 00 | λ | λ | 1 | - |
| 01 | 0 | 1 | λ | - | 01 | λ | λ | 1 | - |
| 11 | 0 | - | - | - | 11 | λ | - | - | - |
| 10 | 1 | - | λ | λ | 10 | λ | - | 1 | 0 |

| J0=q1!q3 | | | | | K0=q1 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 1 | λ | λ | - | 00 | λ | 0 | 1 | - |
| 01 | 1 | λ | λ | - | 01 | λ | 0 | 1 | - |
| 11 | 0 | - | - | - | 11 | λ | - | - | - |
| 10 | 0 | - | λ | 1 | 10 | λ | - | 1 | λ |



Задание 3

Счетчик 0..9

| Q3 | Q2 | Q1 | Q0 | Q3* | Q2* | Q1* | Q0* | J3 | K3 | J2 | K2 | J1 | K1 | J0 | K0 |
|----|----|----|----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | λ | 0 | λ | 0 | λ | 1 | λ |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | λ | 0 | λ | 1 | λ | λ | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | λ | 0 | λ | λ | 0 | 1 | λ |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | λ | 1 | λ | λ | 1 | λ | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | λ | λ | 0 | 0 | λ | 1 | λ |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | λ | λ | 0 | 1 | λ | λ | 1 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | λ | λ | 0 | λ | 0 | 1 | λ |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | λ | λ | 1 | λ | 1 | λ | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | λ | 0 | 0 | λ | 0 | λ | 1 | λ |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | λ | 1 | 0 | λ | 0 | λ | λ | 1 |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

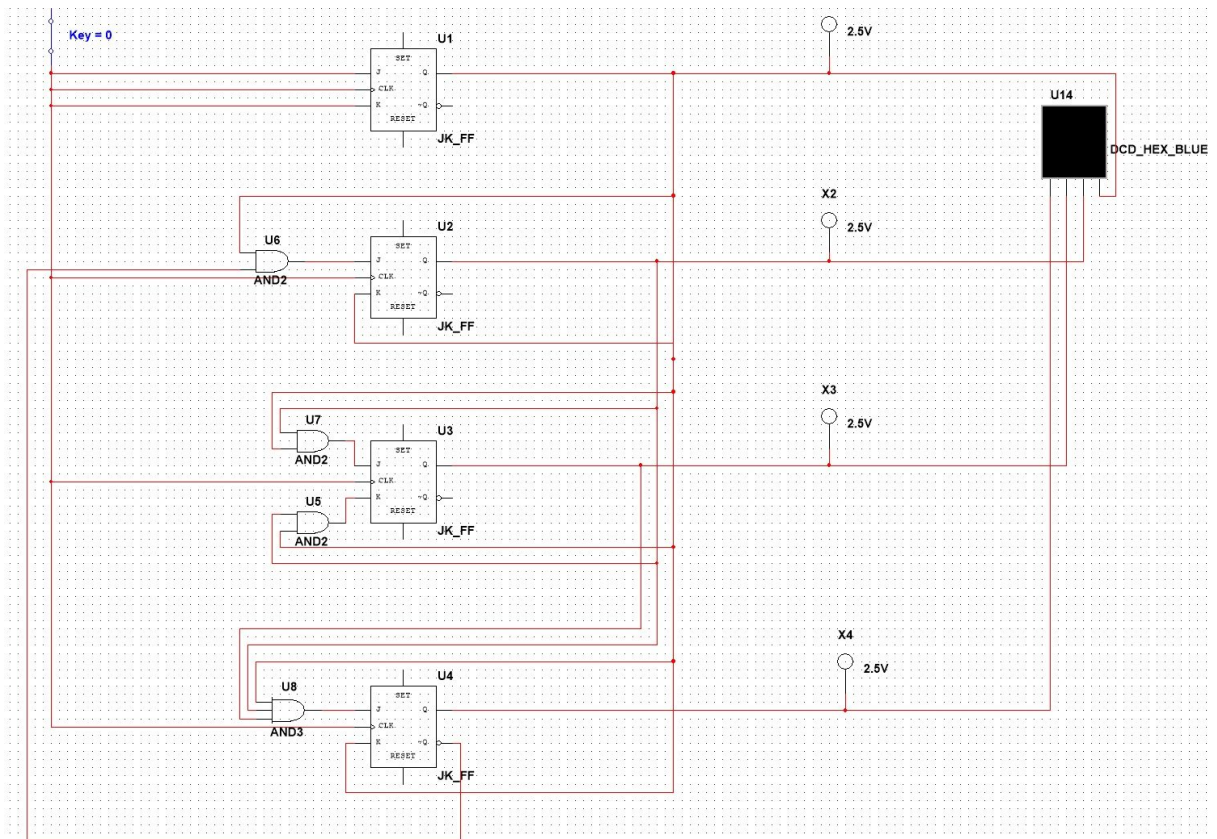
Минимизация

| J3=q0q1q2 | | | | | K3=q0 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 0 | 0 | 00 | λ | λ | λ | λ |
| 01 | 0 | 0 | 1 | 0 | 01 | λ | λ | λ | λ |
| 11 | - | - | - | - | 11 | - | - | - | - |
| 10 | λ | λ | - | - | 10 | 0 | 1 | - | - |

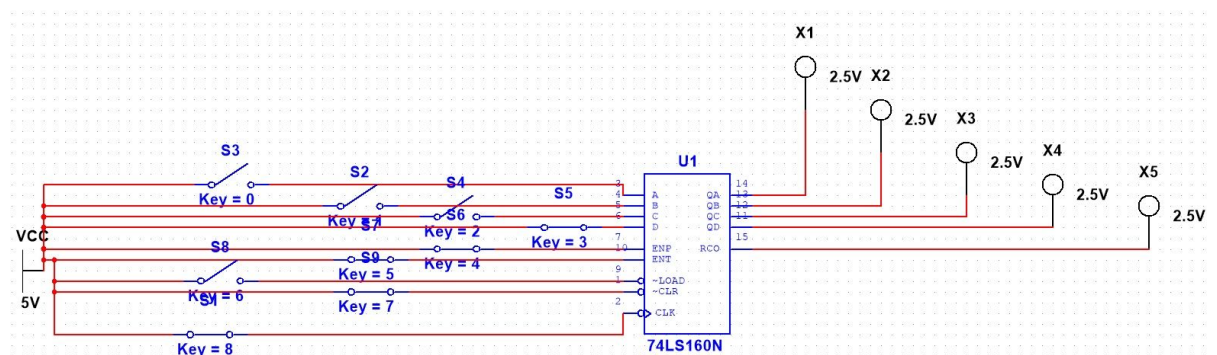
| J2=q0q1 | | | | | K2=q0q1 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 0 | 1 | 0 | 00 | λ | λ | λ | λ |
| 01 | λ | λ | λ | λ | 01 | 0 | 0 | 1 | 0 |
| 11 | - | - | - | - | 11 | - | - | - | - |
| 10 | 0 | 0 | - | - | 10 | λ | λ | - | - |

| J1=q0!q3 | | | | | K1=q0 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 0 | 1 | λ | λ | 00 | λ | λ | 1 | 0 |
| 01 | 0 | 1 | λ | λ | 01 | λ | λ | 1 | 0 |
| 11 | - | - | - | - | 11 | - | - | - | - |
| 10 | 0 | 0 | - | - | 10 | λ | λ | - | - |

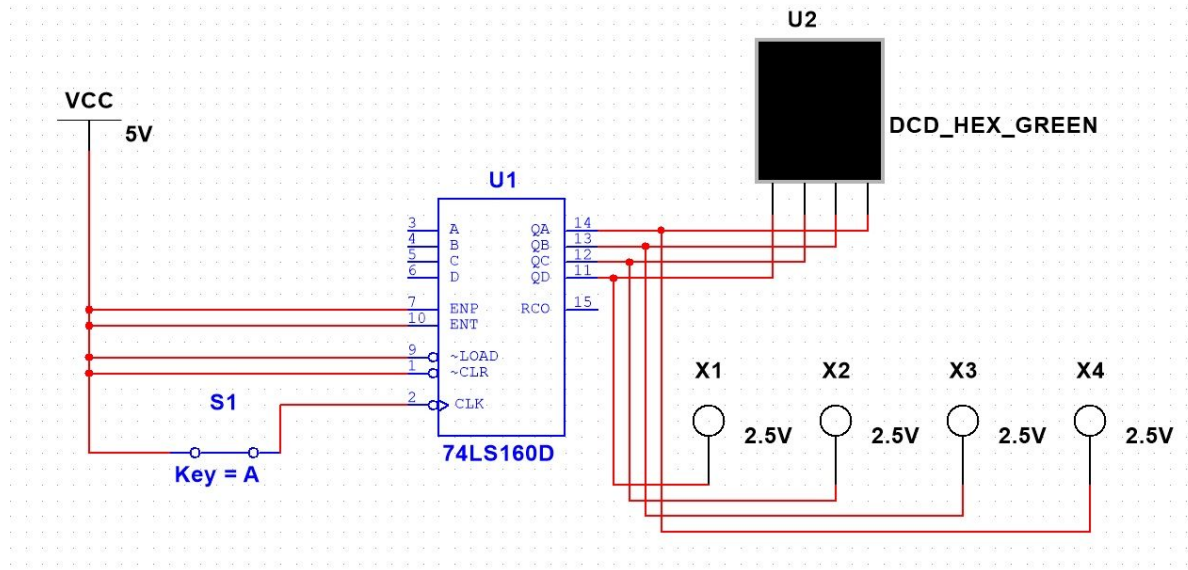
| J0=1 | | | | | K0=1 | | | | |
|-----------|----|----|----|----|-----------|----|----|----|----|
| q3q2\q1q0 | 00 | 01 | 11 | 10 | q3q2\q1q0 | 00 | 01 | 11 | 10 |
| 00 | 1 | λ | λ | 1 | 00 | λ | 1 | 1 | λ |
| 01 | 1 | λ | λ | 1 | 01 | λ | 1 | 1 | λ |
| 11 | - | - | - | - | 11 | - | - | - | - |
| 10 | 1 | λ | - | - | 10 | λ | 1 | - | - |



Задание 4



Задание 5



Задание 6

