**Міністерство освіти і науки України**

**Національний технічний університет України**

**“Київський політехнічний інститут”**

**Факультет прикладної математики**

**Кафедра спеціалізованих комп’ютерних систем**

**Лабораторна робота № 4**

з дисципліни «Схемотехніка»

«Проектування лічильників на потенціальних елементах»



Виконав :

Студент групи КВ-32

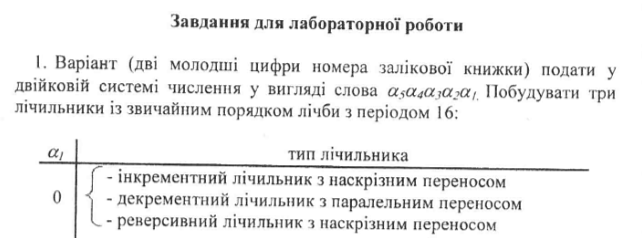
**Сидоренко Владислав**

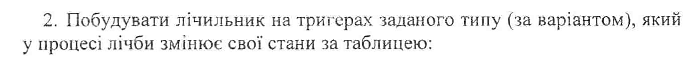
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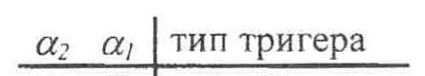
Клятченко Я.М.

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Київ 2015

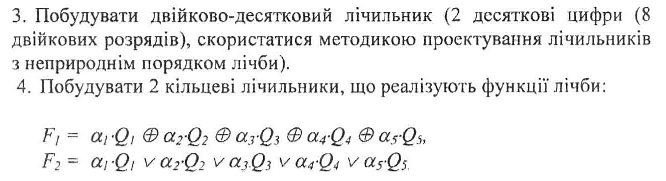






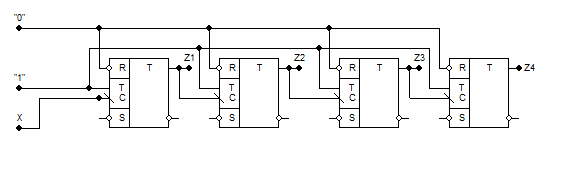
Стани лічильника

|  |  |  |  |
| --- | --- | --- | --- |
| Q4 | Q3 | Q2 | Q1 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

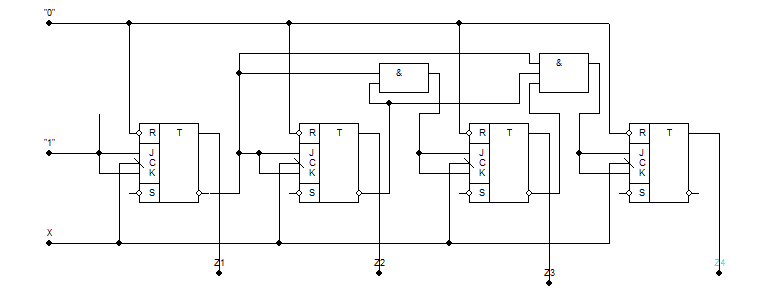


1. Побудувати 3 лічильники зі звичайним порядком лічби з періодом 16

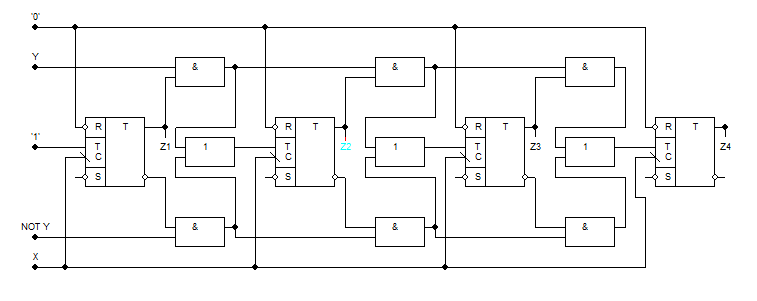
- Інкрементний лічильник з наскрізним переносом



- Декрементний лічильник з паралельним переносом



- Реверсивний лічильник з наскрізним переносом



2.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q4 | Q3 | Q2 | Q1 | FJ4 | FK4 | FJ3 | FK3 | FJ2 | FK2 | FJ1 | FK1 |
| 0 | 0 | 0 | 0 | 0 | \* | 0 | \* | 1 | \* | 0 | \* |
| 0 | 0 | 1 | 0 | 0 | \* | 0 | \* | \* | 0 | 1 | \* |
| 0 | 0 | 1 | 1 | 0 | \* | 1 | \* | \* | 1 | \* | 0 |
| 0 | 1 | 0 | 1 | 0 | \* | \* | 0 | 1 | \* | \* | 1 |
| 0 | 1 | 1 | 0 | 1 | \* | \* | 1 | \* | 1 | 0 | \* |
| 1 | 0 | 0 | 0 | \* | 0 | \* | 0 | 1 | \* | 0 | \* |
| 1 | 0 | 1 | 0 | \* | 0 | \* | 0 | \* | 0 | 1 | \* |
| 1 | 0 | 1 | 1 | \* | 0 | 1 | \* | \* | 1 | \* | 0 |
| 1 | 1 | 0 | 1 | \* | 0 | \* | 0 | 1 | \* | \* | 1 |
| 1 | 1 | 1 | 0 | \* | 1 | \* | 1 | \* | 1 | 0 | \* |

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | \* | \* | \* |
| \* | \* | \* | 0 |
| 1 | \* | \* | \* |
| 0 | \* | \* | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
| \* | 0 | \* | \* |
| \* | \* | 0 | \* |
| \* | 1 | \* | \* |
| \* | 0 | 0 | \* |

FJ4 = not(Q1)\*Q3 FK4 = not(Q1)\*Q3

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | \* | \* |
| \* | \* | \* | \* |
| \* | \* | \* | \* |
| 0 | \* | \* | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | \* | \* |
| \* | \* | 0 | 0 |
| 1 | 1 | \* | \* |
| \* | 0 | 0 | \* |

FJ3 = 1 FK3 = not(Q1)\*Q3

|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | \* | \* |
| \* | \* | 1 | 1 |
| \* | \* | \* | \* |
| \* | \* | 1 | 1 |

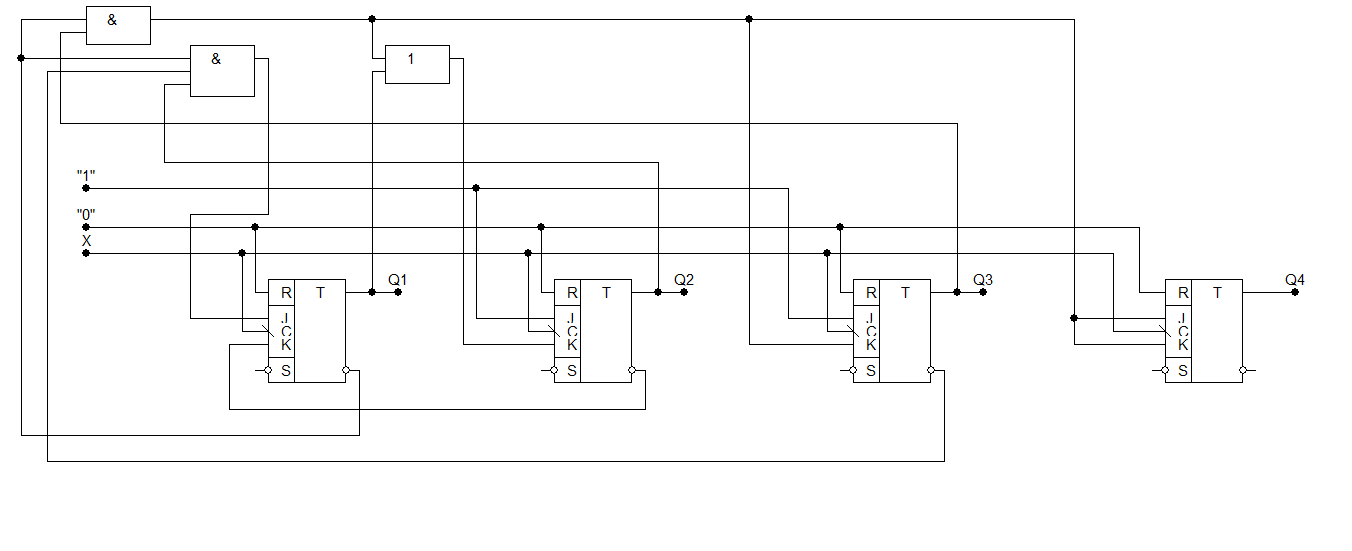
|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1 | \* | \* |
| \* | \* | \* | \* |
| 1 | 1 | \* | \* |
| 0 | 0 | \* | \* |

FJ2 = 1 FK2 = Q1 v not(Q1)\*Q3

|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | \* | \* |
| \* | \* | \* | \* |
| 0 | 0 | \* | \* |
| 1 | 1 | 0 | 0 |

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 0 | \* | \* |
| \* | \* | 1 | 1 |
| \* | \* | \* | \* |
| \* | \* | \* | \* |

FJ1 = not(Q1)\*Q2\*not(Q3) FK1 = not(Q2)



3.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Q4 | Q3 | Q2 | Q1 | T4 | T3 | T2 | T1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | 1 | 0 |
| \* | \* | \* | \* |
| 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 |

T4 = Q1Q4 or Q2 Q3 Q4

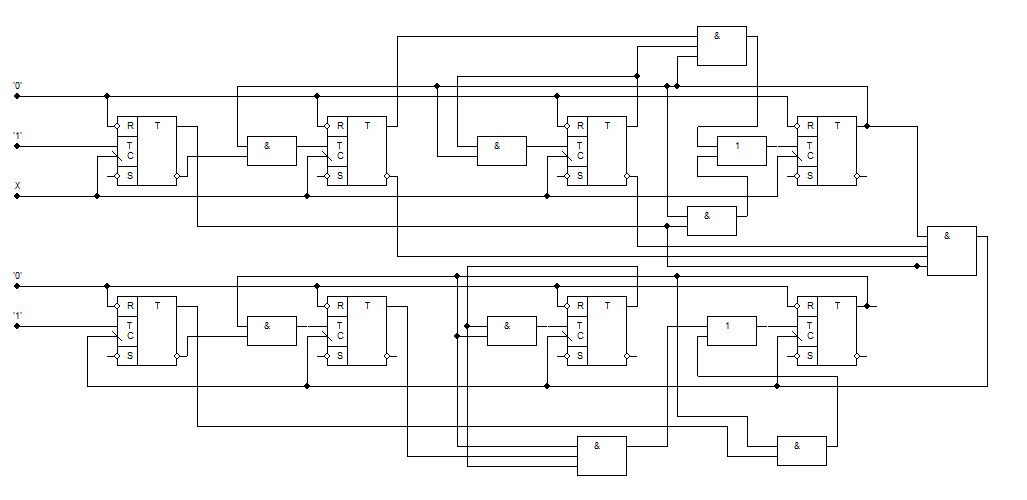
|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | 0 | 0 |
| \* | \* | \* | \* |
| 0 | 1 | 1 | 0 |
| 0 | 0 | 0 | 0 |

T3 = Q3 Q4

|  |  |  |  |
| --- | --- | --- | --- |
| \* | \* | 0 | 0 |
| \* | \* | \* | \* |
| 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 |

T2 = notQ1 Q4

T1 = “1”



4.

F1 = Q2 Q4

F2 = Q2 Q4

