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| Lab 12 | |
| **Topic** | **Sequential circuit using SR, D, JK and T flip-flop** |
| **Software** | * Circuit Maker 2000 * logic.ly (Web Source) |
| **Objective** | * To understand working of Sequential circuit using flip-flops * To Validate the above implementation using Circuit Maker |
| **Reg. #** |  |
| **Name** |  |

## Task 1: 5 Marks

1. Draw the graphic symbol (block diagram) of **SR Flip Flop** on page. Mention/label all inputs and output clearly.
2. Draw the characteristic table.
3. Draw circuit diagram of SR Flip-flop on circuit maker and verify from Characteristic Table.
4. Find Q(t+1) equation by using K-Map and Grouping Technique.

## Task 2: 5 Marks

1. Draw the graphic symbol (block diagram) of **D Flip Flop** on page. Mention/label all inputs and output clearly.
2. Draw the characteristic table.
3. Draw circuit diagram of D Flip-flop on circuit maker and verify from Characteristic Table.
4. Find Q(t+1) equation by using K-Map and Grouping Technique.

## Task 3: 5 Marks

1. Draw the graphic symbol (block diagram) of **JK Flip Flop** on page. Mention/label all inputs and output clearly.
2. Draw the characteristic table.
3. Draw circuit diagram of JK Flip-flop on circuit maker and verify from Characteristic Table.
4. Find Q(t+1) equation by using K-Map and Grouping Technique.

## Task 4: 5 Marks

1. Draw the graphic symbol (block diagram) of **T Flip Flop** on page. Mention/label all inputs and output clearly.
2. Draw the characteristic table.
3. Draw circuit diagram of T Flip-flop on circuit maker and verify from Characteristic Table.
4. Find Q(t+1) equation by using K-Map and Grouping Technique.

**Each Question Carry 20 Marks. Total Mark 100. One Question is BONUS QUESTION.**

**Graded Tasks are only from TASK 5 to TASK 8.**

**80 marks for Graded Tasks and 20 Marks for remaining tasks.**

Important steps for Flip-Flop conversion

**Step 1:** Identify the available and required flip flop.

**Step 2:** Make excitation table for available flip flop.

**Step 3:** Make characteristic table for required flip flop.

**Step 4:** Write Boolean expressions for available flip flop.

**Step 5:** Draw the circuit diagram.

**NOTE: Please submit ONE \*.CKT file along with ONE PNG image per circuit. Any other format will not be accepted. Circuit snapshot also add in your Solved lab document.**

## Task 5:

1. By using conversion techniques, provide the step wise solution for **Jk flip-flop to SR flip-flop** conversion.
2. Implement on circuit maker and submit \*.CKT file.

## Task 6:

1. By using conversion techniques, provide the step wise solution for **Jk flip-flop to D flip-flop** conversion.
2. Implement on circuit maker and submit \*.CKT file.

## Task 7:

1. By using conversion techniques, provide the step wise solution for **Jk flip-flop to T flip-flop** conversion.
2. Implement on circuit maker and submit \*.CKT file.

## Task 8:

Prove the following characteristics equations with the help of characteristic table.

**Application of Flip-flops**

## Task 9: [ No Marks but solution should be mandatory. ]

Design a frequency divider by using JK flip-flop.

1. Frequency should be divided by 4.
2. Frequency should be divided by 16.

## Task 10: [ No Marks but solution should be mandatory. ]

Design a frequency divider by using D flip-flop.

1. Frequency should be divided by 4.
2. Frequency should be divided by 16.