(Affiliated To Tribhuvan University)

NIST College
Department of BScCSIT
First Semester
Digital Logic Design

Tutorial 4

Sequential Circuits/Counters/Shift-Registers

1. Draw the block diagram of sequential circuit and explain it.
2. Differentiate between sequential circuit and combinational circuit.
3. Differential between synchronous sequential circuit and asynchronous sequential circuit.
4. Differentiate between Flip-flops and Latches.
5. Explain the operation of SR flip-flop with necessary diagram, characteristic table, characteristic equation and excitation table and timing diagram.
6. Explain the operation of JK flip-flop with necessary diagram, characteristic table, characteristic equation and excitation table and timing diagram.
7. Explain the operation of D flip-flop with necessary diagram, characteristic table, characteristic equation and excitation table and timing diagram.
8. How master slave flip-flop operates? Explain.
9. What do you mean by counter? What are its type?
10. Why asynchronous counter is called a ripple counter?
11. Define glitches.
12. Design the asynchronous counter:
    a. 2-bit binary (MOD -4) asynchronous up counter
    b. 3-bit binary (MOD -8) asynchronous up counter
    c. 4-bit binary (MOD -16) asynchronous up counter
    d. BCD Decade (MOD-10) up counter
    e. MOD-7 up counter
    f. MOD-13 up counter
    g. 2-bit (MOD -4) asynchronous down counter
    h. 3-bit (MOD -8) asynchronous down counter
    i. 4-bit (MOD -16) asynchronous down counter

j. MOD-7 down counter

k. MOD-12 down counter

13. Design the following synchronous counter:

a. 2-bit binary (MOD -4) synchronous up counter

b. 3-bit binary (MOD -8) synchronous up counter

c. 4-bit (MOD -16) asynchronous up counter

d. BCD Decade (MOD-10) up counter

e. 2-bit binary (MOD -4) down counter

f. 3-bit binary (MOD -8) down counter

g. 4-bit binary (MOD -16) down counter

h. 3-bit UP/DOWN counter

14. What do you mean by shift register? What are its types?

15. Explain different types of shift register with necessary diagrams.

16. Differentiate between Johnson counter (Switch-Tail) and Ring counter.