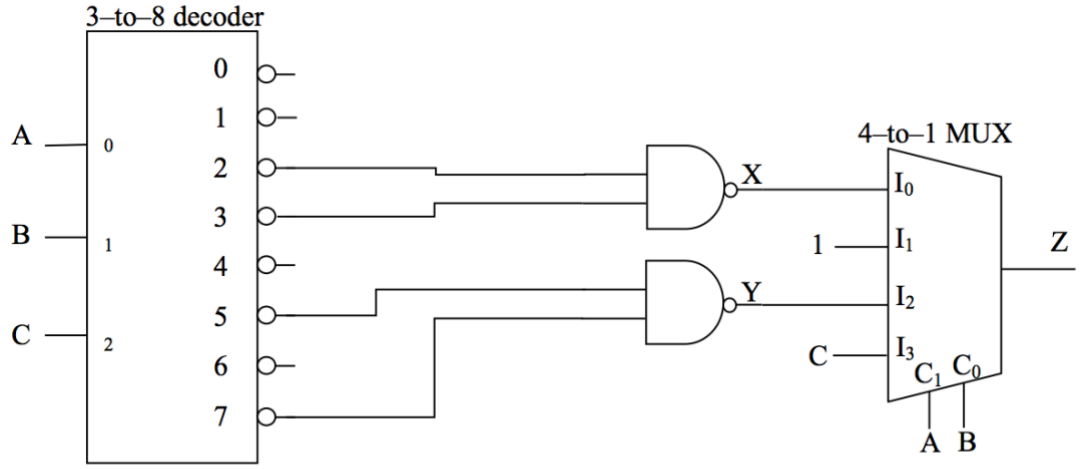
OL Academy

ITCE112/250
Final Exam Revision

Question [1]:

For the circuit shown below, determine the Boolean functions at point X and Y as well as the output Z. Write Z as minimum sums of products SoP.



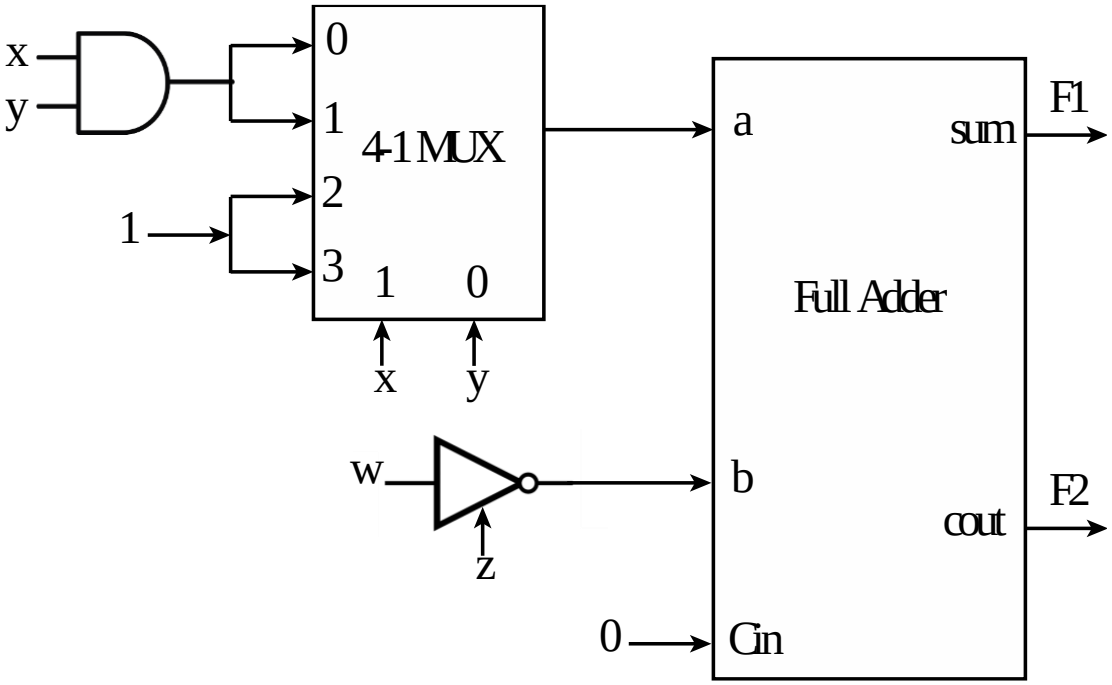
Question [2]:
A combinational circuit has 4 inputs (A, B, C, D) and 1 output (F). ABCD represent a majority function. The output of the majority function is equal to 1 if the input variables have more 1's than 0's, otherwise the output is 0.

a. Construct the truth table of the required circuit.

b. Implement the minimized expression of **F** using 3-level all NAND gate circuit.

c. Implement a 2-1 Multiplexer using three-state buffers.

Question [3]:



a. Derive the truth table and output equations of a Full Adder.

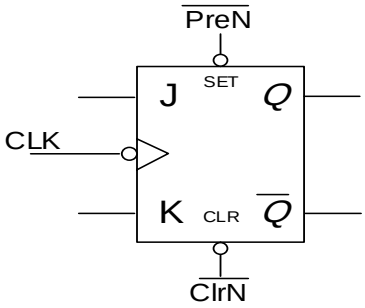
b. Write the input equations of the given F-A.

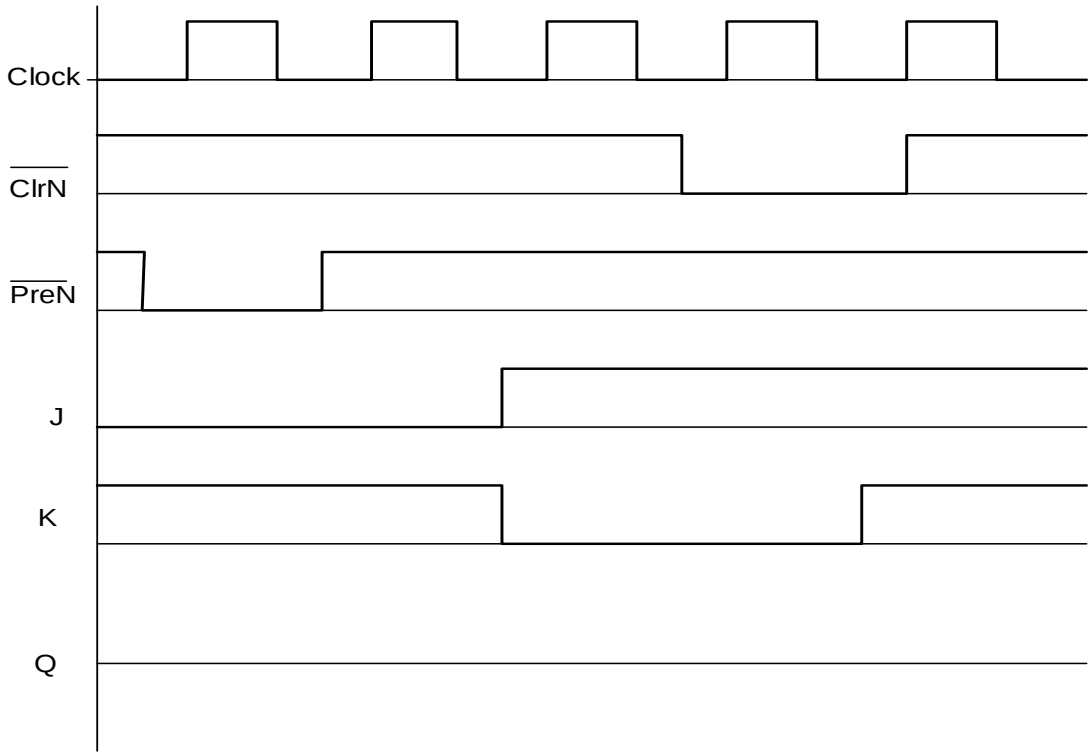
c. Write the output equations of the given FA as Sum of Products.

Question [4]:

a. Convert a T flip flop to J-K flip flop. Show all steps and draw the converted T-FF.

b. Complete the timing diagram for the given J-K Flip-Flop. Assume initially Q is 0. Label each interval in finding Q.





Question [5]:

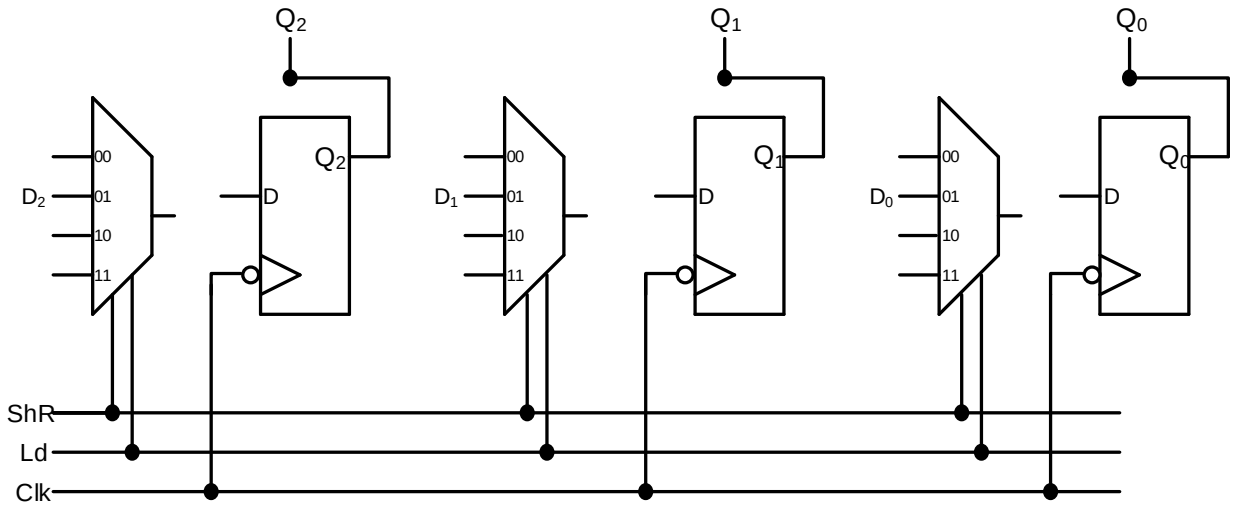
An incomplete register circuit is shown in the figure given below.

a) Add the required connections to make the circuit work as a 3-bit **parallel-in**, **parallel-out** ***shift-right*** register.

b) Complete the register operation table shown below by adding the input values, the next state values and the actions (such as NC (No Change or Hold), Ld (Load), and ShR (Shift Right)).

c) Write the next state equations of the three flip-flops.

Inputs *ShR*(shift)	*L*(load)	Next State Q_2^+ Q_1^+ Q_0^+	Action
0	0	Q2 Q1 Q0	No Change



Question [6]:

Design a 3-bit synchronous counter which counts according to the following sequence **001 → 110 → 010 → 101 → 000 → 111** and repeats.

Design the counter using **Two** D-FF and **One** JK-FF such that the JK is the **middle** flip flop.

What is the next count if the counter started with **011** (unused state)?

Question [7] :

For the given sequential circuit:

a. What type of state machine is this circuit and why?
b. Determine the flip-flop input equations and the output equations from the circuit.
c. Derive the next-state equation for each flip-flop from its input equations.
d. Derive the State table.
e. Derive the State Graph.
f. Determine the state sequence and output sequence if the initial state is S_0 and the input sequence is X= 10101