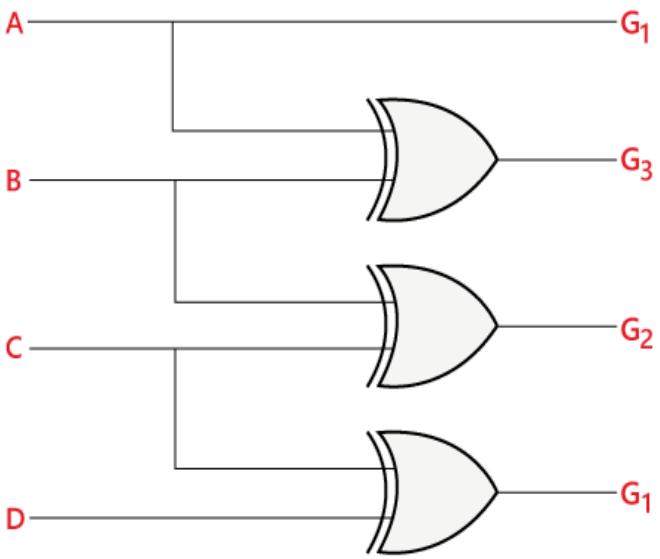
1. Design a BCD to Gray code converter.

BCD Input				Gray Output			
B_0	B_1	B_2	B_3	G_0	G_1	G_2	G_3
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1



2. What are the fundamental properties of Boolean algebra?
   Boolean algebra is a mathematical structure essential for understanding logic, digital circuits, and computer science. Here are the key properties:
   a. Identity Laws
   - AND Identity: A · 1=AA \cdot 1 = AA · 1=A
   - OR Identity: A+0=AA + 0 = AA+0=A

   b. Null Laws
   - AND Null Law: A · 0=0
   - OR Null Law: A+1=1

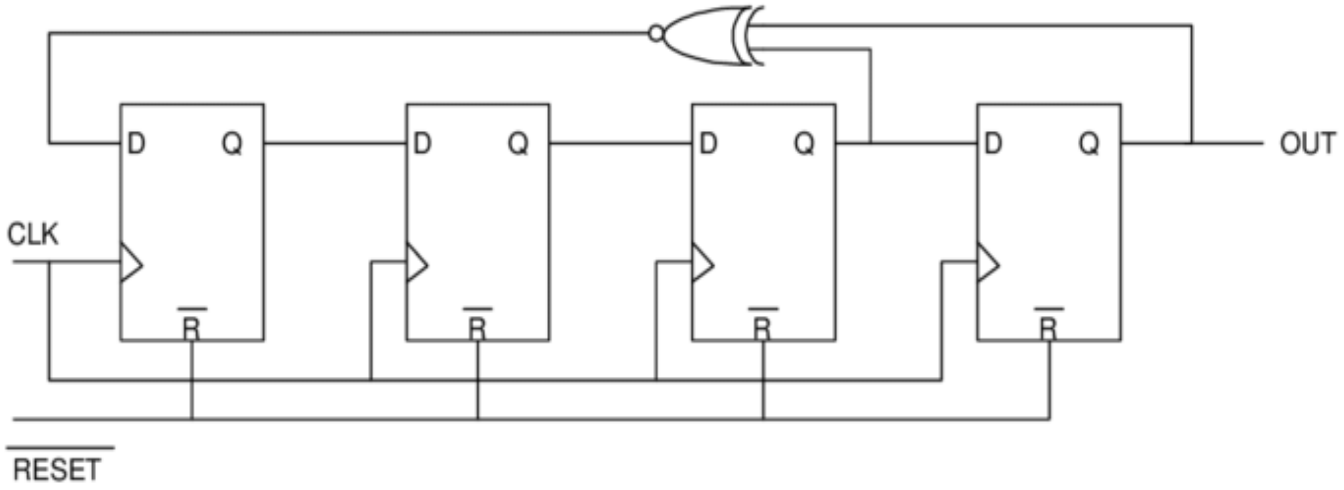
   c. Idempotent Laws
   - A · A=A
   - A+A=A

   d. Complement Laws
   - A · A’=0
   - A+A’=1

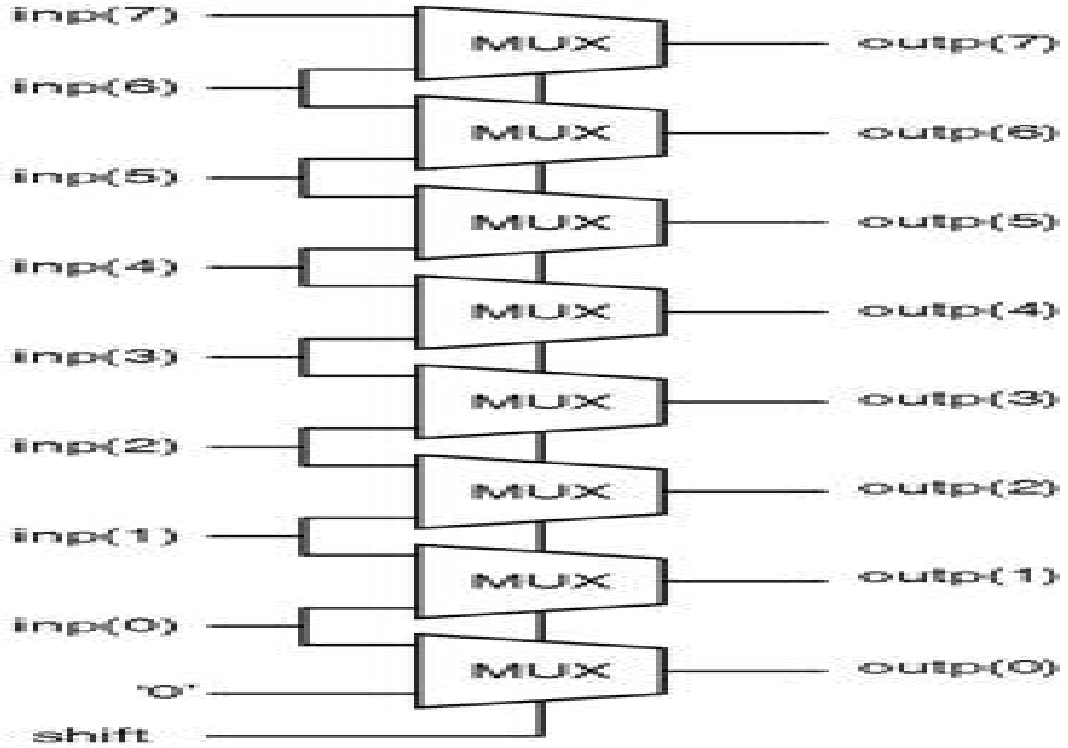
   e. De Morgan's Theorems
   - (A · B)’=A’+B’
   - (A+B)’=A’ · B’

   f. Double Negation Law
   - A’’=A

3. What is meant by isomorphic Boolean algebra?
   Isomorphic Boolean algebras refer to two Boolean algebras that are structurally identical in the sense that there is a one-to-one correspondence between their elements that preserves the algebra's operations.
4. What is a synchroniser?
   A synchroniser is a digital circuit or device used in electronics and digital systems to ensure that signals or data transferred between different clock domains are aligned properly.
5. Design a sequence detector for 1X1X with overlap.
6. Draw and explain the 4-bit Linear Feedback Shift Register.
   A 4-bit Linear Feedback Shift Register (LFSR) is a sequential shift register that uses linear feedback to produce a sequence of binary values that appear random. It is often used in applications like pseudo-random number generation, cryptography, and digital circuits for testing and verification.



7. Draw and explain the 4-bit barrel shifter using MUX



A 4-bit Barrel Shifter is a combinational circuit that can rotate or shift a 4-bit data input left or right by a specified number of positions. A barrel shifter can perform the shift in one clock cycle and is often implemented using multiplexers (MUXes).

8. Design a PISO Shift register?