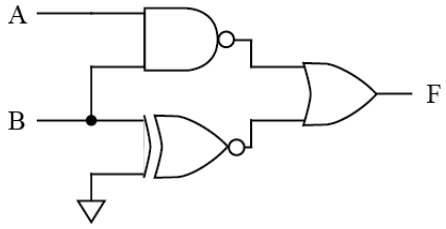
EX: For the circuit shown below, find the simplest possible Boolean expression for F in terms of A and B. The simplest answer has the minimum total number of ANDS, ORS, and NOTS (inverters).



SOL'N: From the diagram, we write a Boolean expression for F.

$$F = \overline{AB} + \overline{B \oplus 0}$$

The Exclusive-OR simply inverts B, leading to simplification:

$$F = \overline{AB} + \overline{B}$$

Using De Morgan's theorem, we can rewrite the first NAND.

$$F = \overline{A} + \overline{B} + \overline{B}$$

Eliminating the redundant term, we have an OR function.

$$F = \overline{A} + \overline{B}$$

Using De Morgan's theorem again, we have a simple NAND function. Thus, the extra Exclusive-NOR and OR gates were redundant.

$$F = \overline{AB}$$