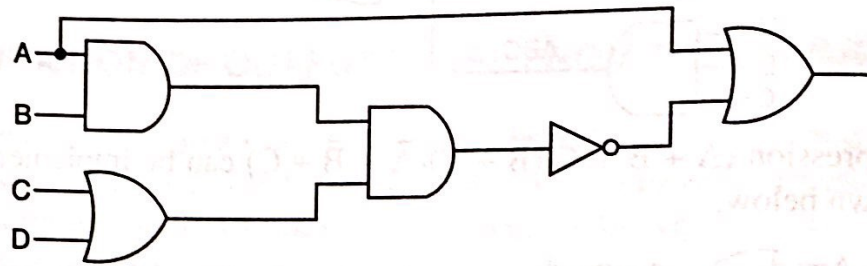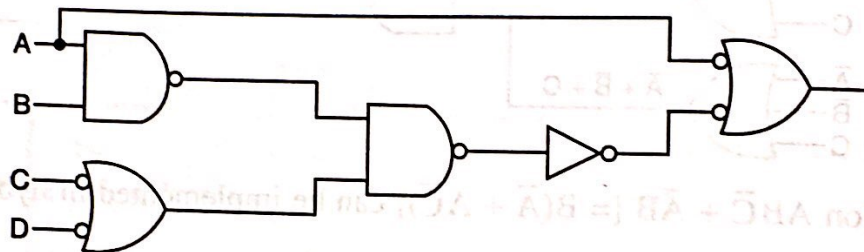**EXAMPLE 5.24**   Convert the following AOI logic circuit to (a) NAND logic, and (b) NOR logic.
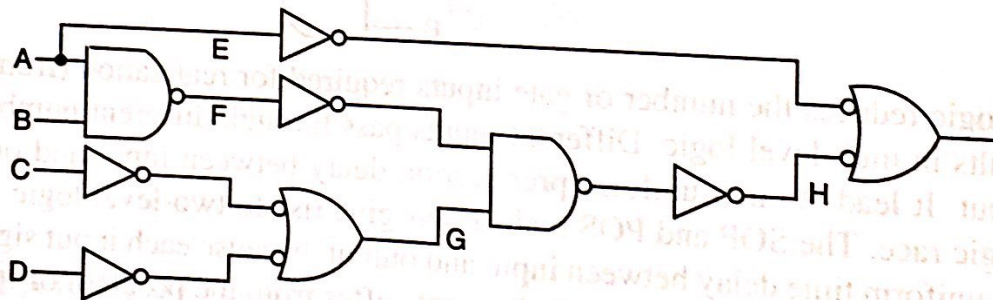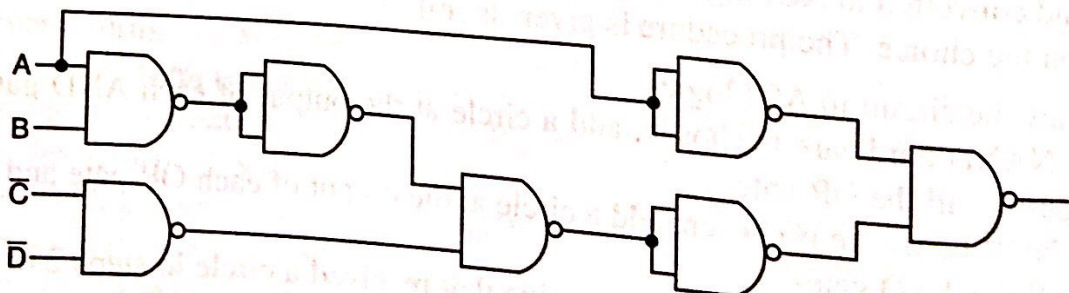

Solution

(a) NAND logic: Put a circle at the output of each AND gate and at the inputs to all OR gates as shown below.
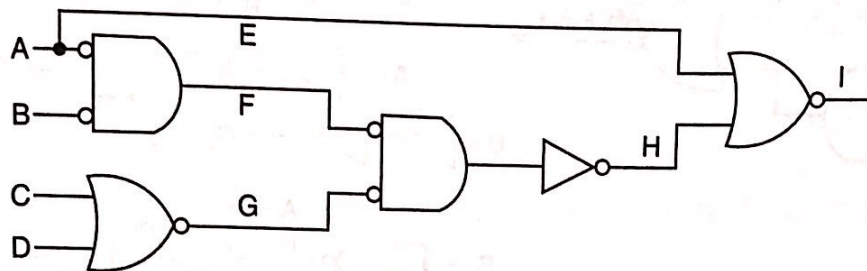

Add an inverter to each of the lines E, F, C, D that received only one circle in the previous step as shown below so that the polarity of these lines remains unchanged. Inverters in lines C and D can be removed, if C and D are replaced by $\bar{C}$ and $\bar{D}$. Line H received two circles. So, no change is required.
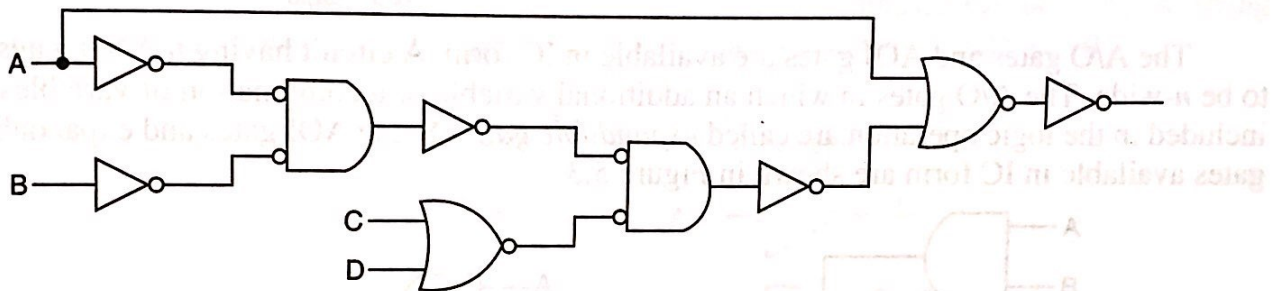

Replace bubbled OR gates and NOT gates by NAND gates. Using only NAND gates, the logic circuit can now be drawn as shown below.

(b) NOR logic: Put a circle at the output of each OR gate and at the inputs to all AND gates as shown below.

Add an inverter in each of the lines A, B, F, and I that received only one circle in the previous step, so that the polarity of these lines remains unchanged. Line G received two circles. So, no change is required.

Replace bubbled AND gates and NOT gates by NOR gates. Using only NOR gates, the logic circuit can now be drawn as shown below. Note that the inverter in line B has been removed assuming that $\overline{B}$ is available.