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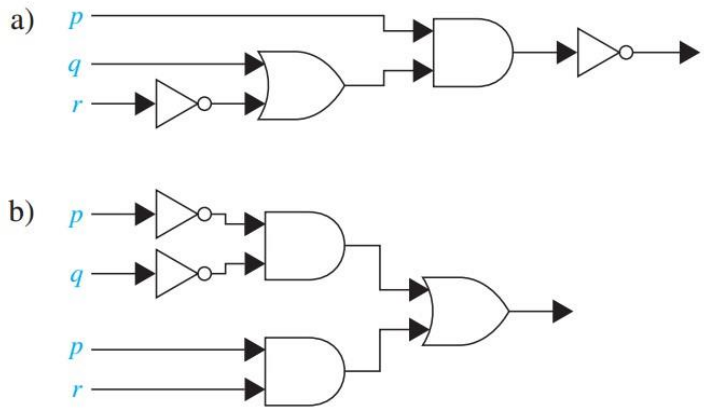
Discrete Mathematics and its Application by Kenneth Rosen chapter 1
Section 1.2,problem 41:

41. Find the output of each of these combinatorial circuits.



Answer:

a.The output of the or gate is $q \vee \neg r$.

Therefore the output of the AND gate is $p \wedge (q \vee \neg r)$.

Therefore the output of the circuit is $\neg(p \wedge (q \vee \neg r))$.

b.The upper AND gate produces the output of $\neg p \wedge \neg q$ and the lower AND gate produces output of $p \wedge r$.

Therefore the output of the circuit is $(\neg p \wedge \neg q) \vee (p \wedge r)$