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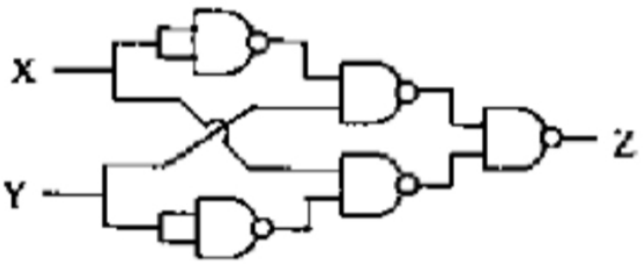
GATE Question No. 41

Question

For any set of inputs A and B, the following circuits give the same output Q, except one. Which one is it?

Given Circuits



Question Analysis

Option (a):
$Q = (A \oplus B)\overline{B}$
Since $A \oplus B = A\overline{B} + \overline{A}B$,
$Q = (A\overline{B} + \overline{A}B)\overline{B}$
$Q = A\overline{B}$
Option (b):
$Q = A\overline{B}$
Option (c):
After simplification, it reduces to:
$Q = A\overline{B}$
Option (d):
$Q = \overline{A} + B$

Thus, option (d) produces a different output.

Truth Table Comparison

A	B	$A\overline{B}$	$\overline{A}+B$
0	0	0	1
0	1	0	1
1	0	1	0
1	1	0	1

Conclusion

Options (a), (b), and (c) implement the function:
$Q = A\overline{B}$
Option (d) implements:
$Q = \overline{A} + B$
Since the outputs are not identical for all input combinations, option (d) is the incorrect circuit.