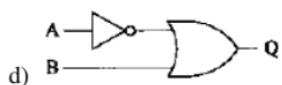
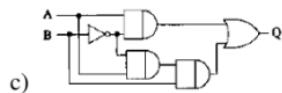
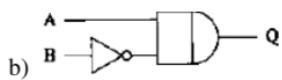
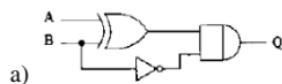


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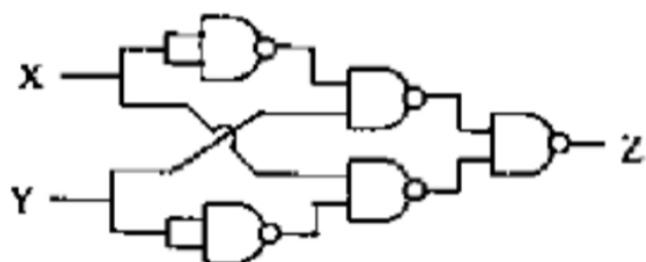
GATE Question No. 41

Question

9



Given Circuits



Question Analysis

The problem states that three circuits produce the same output and one circuit produces a different output.

After simplifying the expressions:

Option (a), (b), and (c) reduce to:

$$Q = A\bar{B}$$

Option (d) reduces to:

$$Q = \bar{A} + B$$

Since these two expressions are different, option (d) is the incorrect one.

Truth Table for $Q = A\bar{B}$

| A | B | Q |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

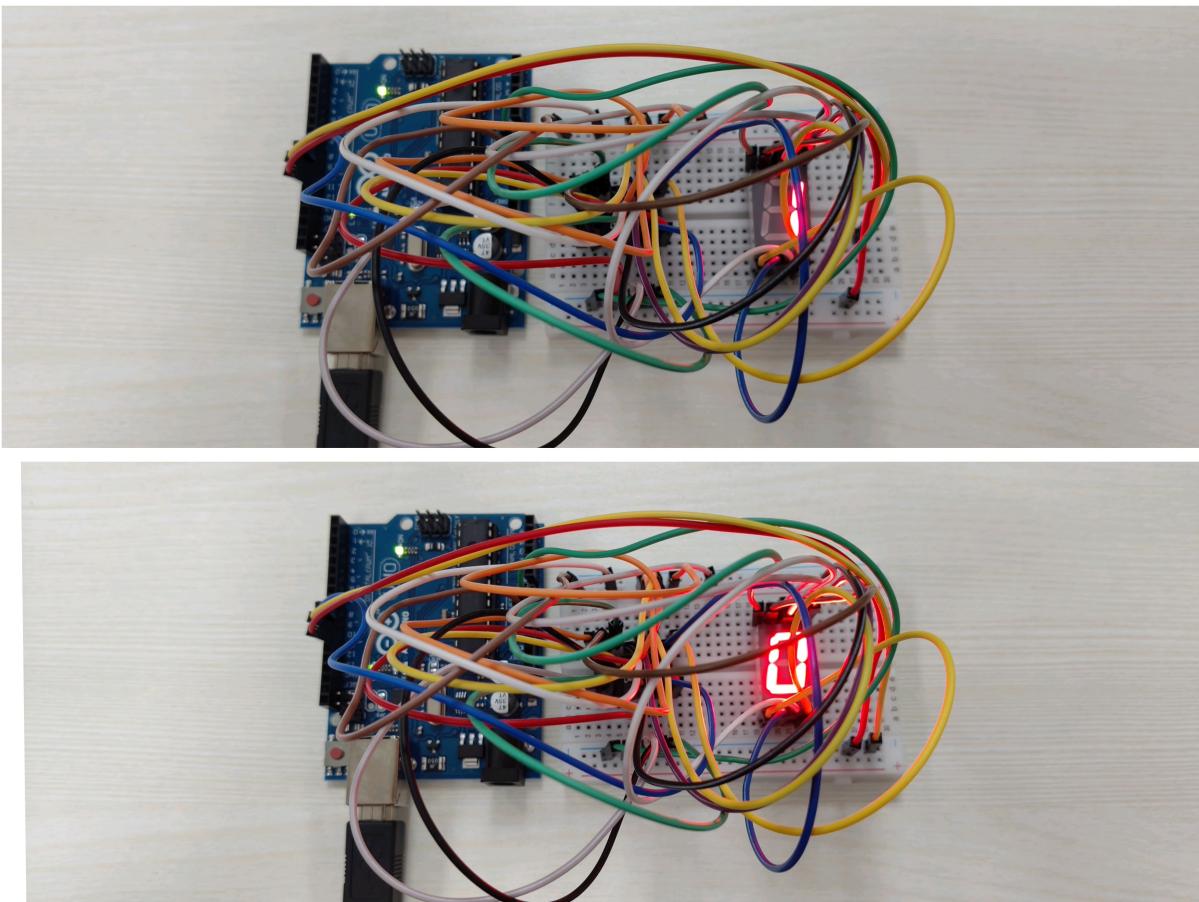
Hardware Implementation

The function implemented using Arduino and 7447:

$$Q = A\bar{B}$$

Connections:

- Arduino Pin 10 → Input A
- Arduino Pin 11 → Input B
- Arduino Pin 9 → 7447 Pin 7
- 7447 Pin 16 → 5V
- 7447 Pin 8 → GND
- 7447 Pins 3,4,5 → 5V
- 7447 Pins 1,2,6 → GND
- 7-segment common pins → 5V



Code Uploading Steps

1. Create a PlatformIO project.
2. Write the code in main.cpp inside src folder.
3. Run the command: `pio run`
4. Copy the generated .hex file to Arduino Droid folder.
5. Connect Arduino UNO using OTG cable.
6. Use Upload Precompiled option.
7. Observe the output on 7-segment display.

Experimental Verification

| A | B | Displayed Output |
|---|---|------------------|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Conclusion

From Boolean simplification and hardware verification, circuits (a), (b), and (c) implement $Q = A\bar{B}$.

Circuit (d) implements $Q = \bar{A} + B$.

Therefore, option (d) is the incorrect circuit.