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Roll: 53

Year/sem: III / II

1. In an alarm system of bank, three sensors are implemented and the alarm is triggered when at least two sensors detect the change. Assuming sensors to output digital values, design a combinational logic circuit for alarm system.

→ Solution,

The truth table is:

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

using K-map,

A \ BC	00	01	11	10
0			1	1
1			1	1

$Y = A'C + AB$

The circuit diagram is,

$$Y = A'C + AB$$
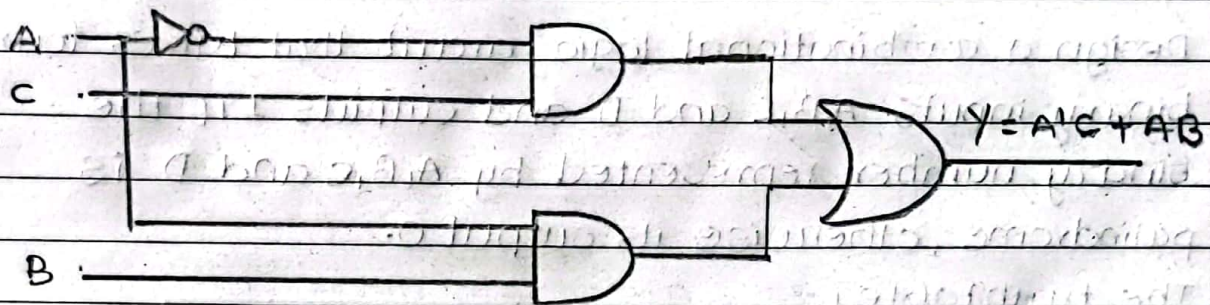
2. Deesign a combinational logic circuit that takes two binary inputs, A and B, and outputs 1 when the binary number represented by A is greater than the binary number represented by B. otherwise, it outputs 0.
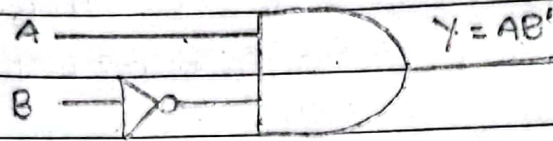
→ solution.
The truth table is:

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	0

$$Y = AB'$$

The circuit diagram is,

$$Y = AB'$$

3. Design a combinational logic circuit that takes four binary inputs A,B,C and D and outputs 1 if the binary number represented by A,B,C and D is palindrome, otherwise its output 0.

→ The truth table is:

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

$Y = A'B'C'D' + A'BCD' + AB'C'D + ABCD$

using k-map

AB\CD	00	01	11	10
00	1			1
01			1	
11				
10		1		

$$Y = A'B'C'D' + A'BCD' + AB'C'D + ABCD$$
$$= A'D'(B'C' + BC) + AD(B'C' + BC)$$
$$= (B'C' + BC)(A'D' + AD)$$
$$= \overline{(B \oplus C)}\, \overline{(A \oplus D)}$$

The circuit diagram is,

$$Y = \overline{(B \oplus C)}\,(\overline{A \oplus D})$$
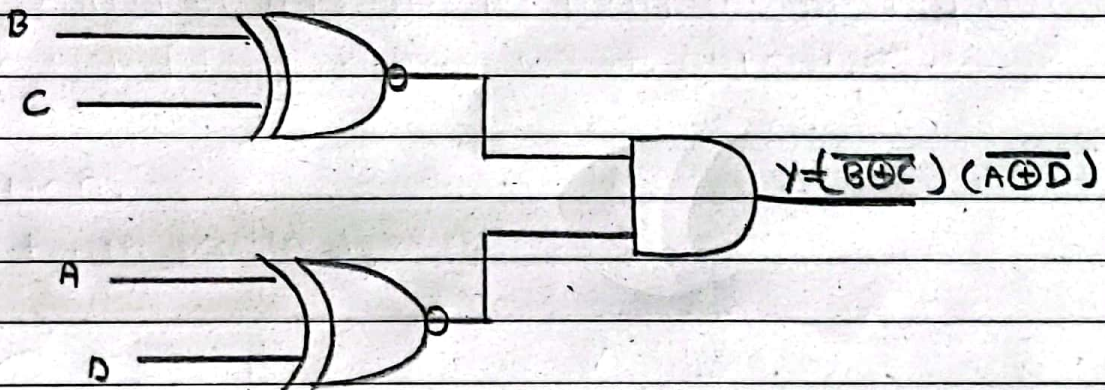
4. Design a combinational logic circuit that takes three binary inputs, A,B.and c and outputs 1 if the binary represented by A,B, and C is a multiple of 3, otherwise It outputs 0.
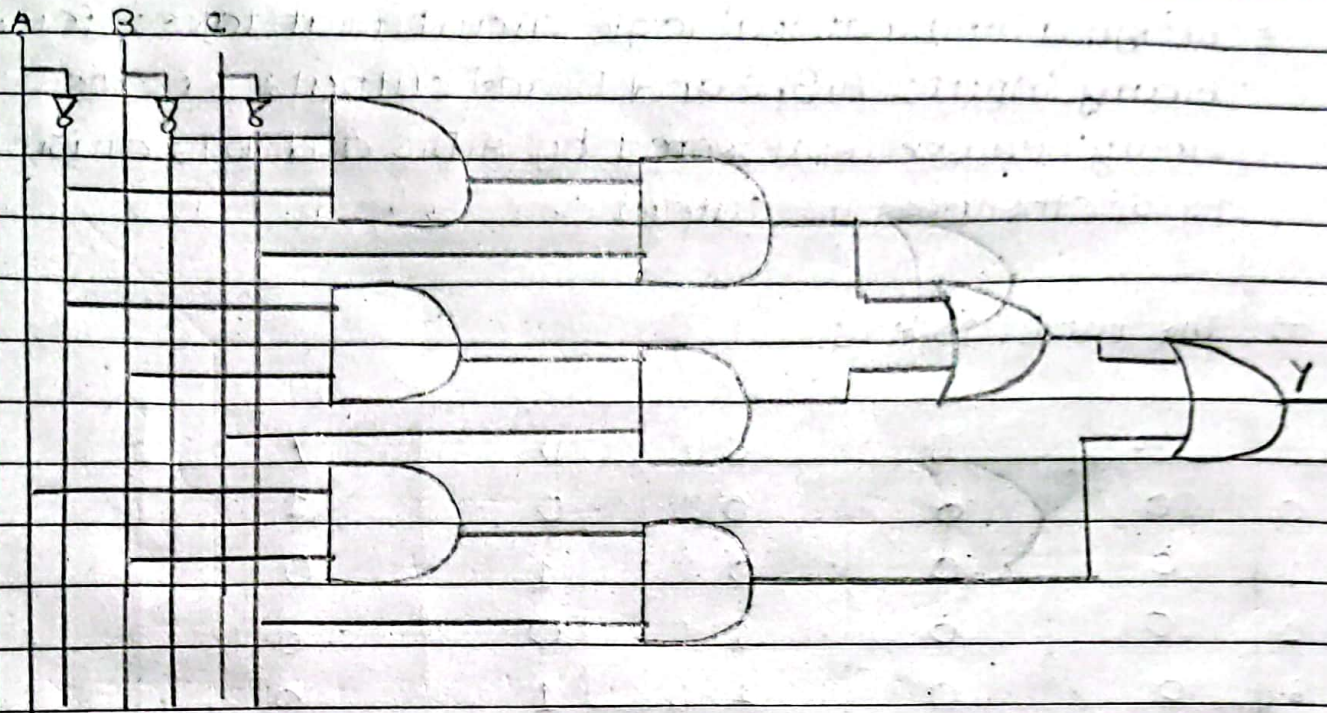
→ The truth table is,

SN	A	B	C	Y
0.	0	0	0	1
1.	0	0	1	0
2.	0	1	0	0
3.	0	1	1	1
4.	1	0	0	0
5.	1	0	1	0
6.	1	1	0	1
7.	1	1	1	0

A \ BC	00	01	11	10
0	1			1
1				1

$$Y = \bar{A}\bar{B}\bar{C} + \bar{A}BC + AB\bar{C}$$

The circuit diagram is,

5. Design a combinational logic circuit that takes four binary inputs A, B, C and D and outputs 1 if the binary number represented by A, B, C and D is divisible by 5, otherwise its output 0.
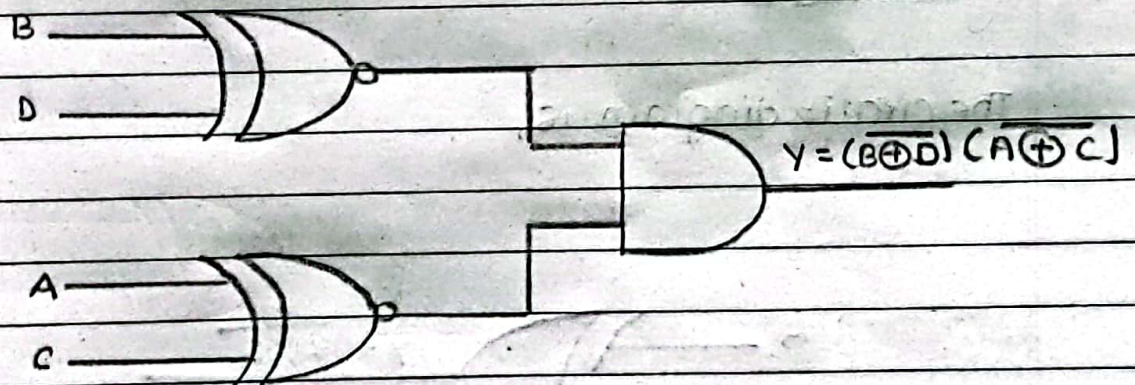
→ The truth table is,

S.N.	A	B	C	D	Y
0	0	0	0	0	1
1.	0	0	0	1	0
2.	0	0	1	0	0
3.	0	0	1	1	0
4.	0	1	0	0	1
5.	0	1	0	1	0
6.	0	1	1	0	0
7.	0	1	1	1	0
8.	1	0	0	0	0
9.	1	0	0	1	0
10.	1	0	1	0	1
11.	1	0	1	1	0
12.	1	1	0	0	0
13.	1	1	0	1	0
14.	1	1	1	0	0
15.	1	1	1	1	1

AB\CD	00	01	11	10
00	1			
01		1		
11			1	
10				1

$$Y = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}D + A\bar{B}C\bar{D} + ABCD$$
$$= \bar{A}\bar{C}(\bar{B}\bar{D} + BD) + AC(\bar{B}\bar{D} + BD)$$
$$= (\bar{B}\bar{D} + BD)(\bar{A}\bar{C} + AC)$$
$$= (\overline{B \oplus D})(\overline{A \oplus C})$$

The circuit diagram is.

$$Y = (\overline{B \oplus D})(\overline{A \oplus C})$$

6. Design a combinational logic circuit that takes two binary inputs A, B, C and D and outputs 1 when the binary number represented by A is equal to the binary number represented by B, otherwise its outputs 0.

→ The truth table is:

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

$$Y = A'B' + AB$$
$$= \overline{A \oplus B}$$

The circuit diagram is,

$$Y = \overline{A \oplus B}$$