Date
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Question 1 →

(b) $\overline{X}Z + \overline{X}Y + X\overline{Y}Z + YZ = \overline{X}Y + \overline{X}Z + X\overline{Y}Z + YZ$

($\because$ $AB + AC = A(B + C)$, by distributive law)

$= \overline{X}Y + (\overline{X} + X\overline{Y})Z + YZ$

$= \overline{X}Y + (\overline{X} + \overline{Y})Z + YZ$ (By Absorption law, $AB + \overline{A} = B + \overline{A}$)

$= \overline{X}Y + \overline{X}Z + \overline{Y}Z + YZ$ (By distribution, $(A+B)C = AB + AC$

$= \overline{X}Y + \overline{X}Z + Z(\overline{Y} + Y)$ (taking common Z, $AB + AC = A(B+C)$

$= \overline{X}Y + \overline{X}Z + Z.1$ (Applying Complement law, $A + \overline{A} = 1$)

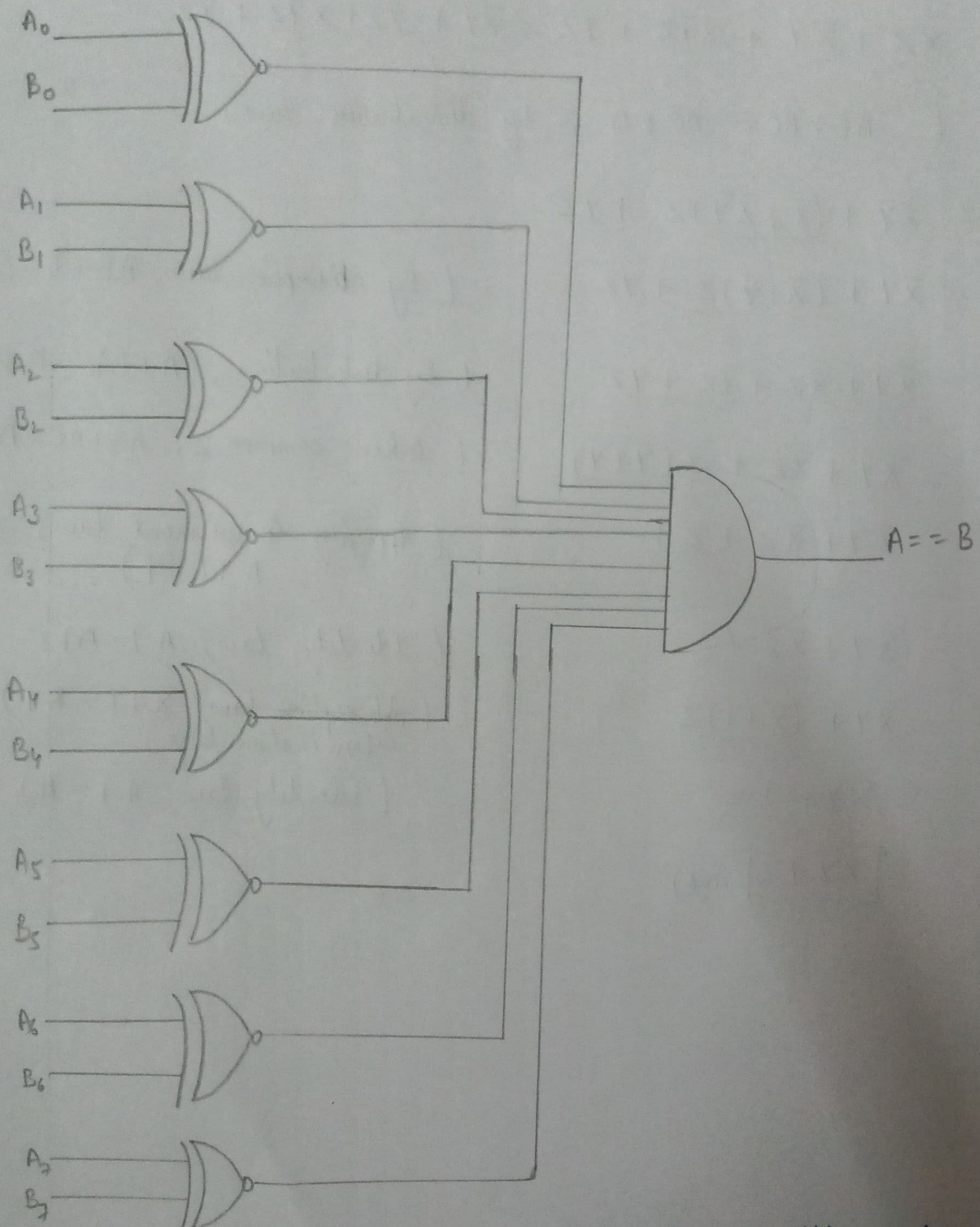
$= \overline{X}Y + \overline{X}Z + Z$ (Identity law, $A.1 = A$)

$= \overline{X}Y + (\overline{X} + 1)Z$ (~~Absorption law~~, $\overline{X} + 1 = 1$)
↳ Domination law

$= \overline{X}Y + 1.Z$ (Identity law, $A.1 = A$)

$= \boxed{\overline{X}Y + Z}$ (Ans)

(a)



8 bit combination circuit that compares two 8 bit numbers,
let A, and B be the two 8 bit numbers.
where A_0, B_0 is least significate bit & A_7, B_7, the most significant
only.

now, if corresponding bits of A and B are equal then the XNOR gives output 1. The truth table for A XNOR B is as follows→

A	B	A XNOR B
0	0	1
0	1	0
1	0	0
1	1	1

After comparing corresponding bits from 0 to 7 for A & B, the same bits (i.e. 0,0 & 1,1) gives output 1, And now we put AND gate which gives output 1 only when all the outputs of XNOR's gate are 1 i.e. all bits are equal of A & B, & 0 when if any one bit does not match.

Therefore, this combinational circuit produces output 1 if the numbers are equal else gives output 0.