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Assignment 2

1. what is Sum of the product:

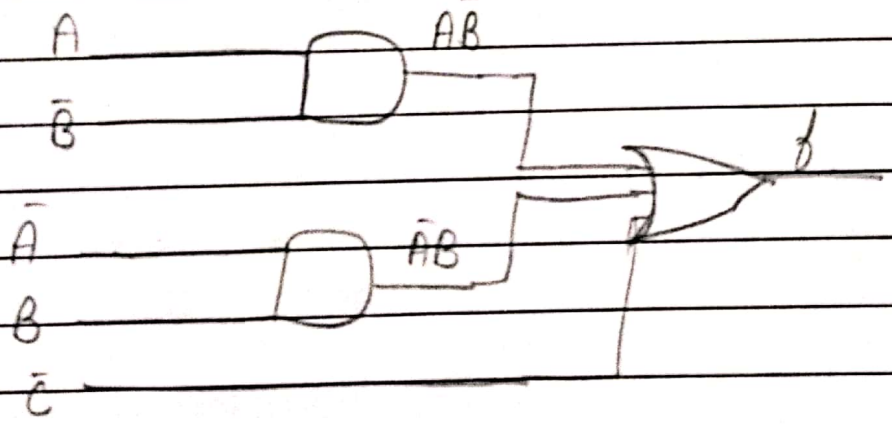
Ans. It consists of two or more AND terms that are ORed together. Each of these AND terms AND terms can contain any number of variable in either true or it complement form

$(A.B) + (\bar{A}.B)$

$\Sigma m(0, 2, 3, 4, 5, 6)$

A \ BC	00	01	11	10
0	1 0	0 1	1 3	1 2
1	1 4	1 5	0 7	1 6

$f = \bar{C} + A\bar{B} + \bar{A}B$



$f = \bar{A}\bar{B}C + AB\bar{C}$

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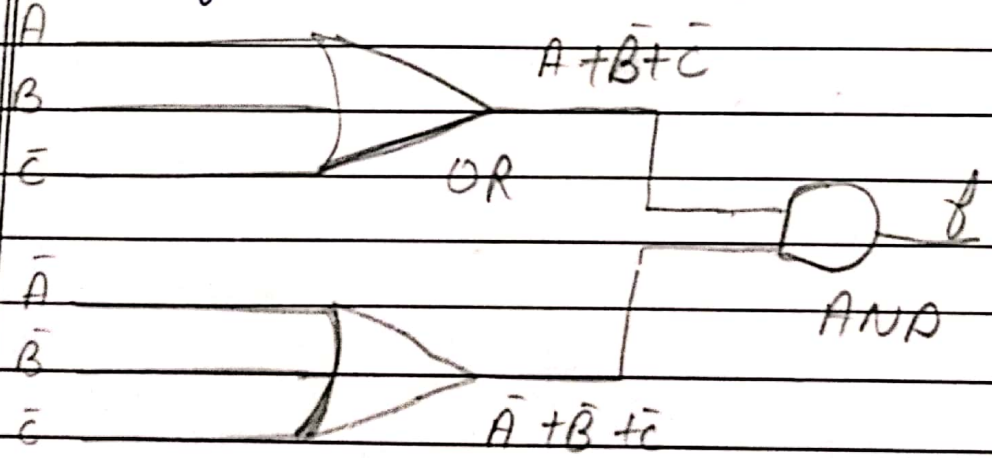
what is product of the Sum ~~for~~ It consists of two or more OR terms that are ANDed together. Each of these OR terms can contain any number of variable in either true or it's complemented form.

$(A+B)\ (\bar{A}+B)$

A \ BC				
	1_0	0_1	1_3	1_2
	1_4	1_5	0_6	1_7

$f = (A+B+\bar{C}) \cdot (\bar{A}+\bar{B}+\bar{C})$



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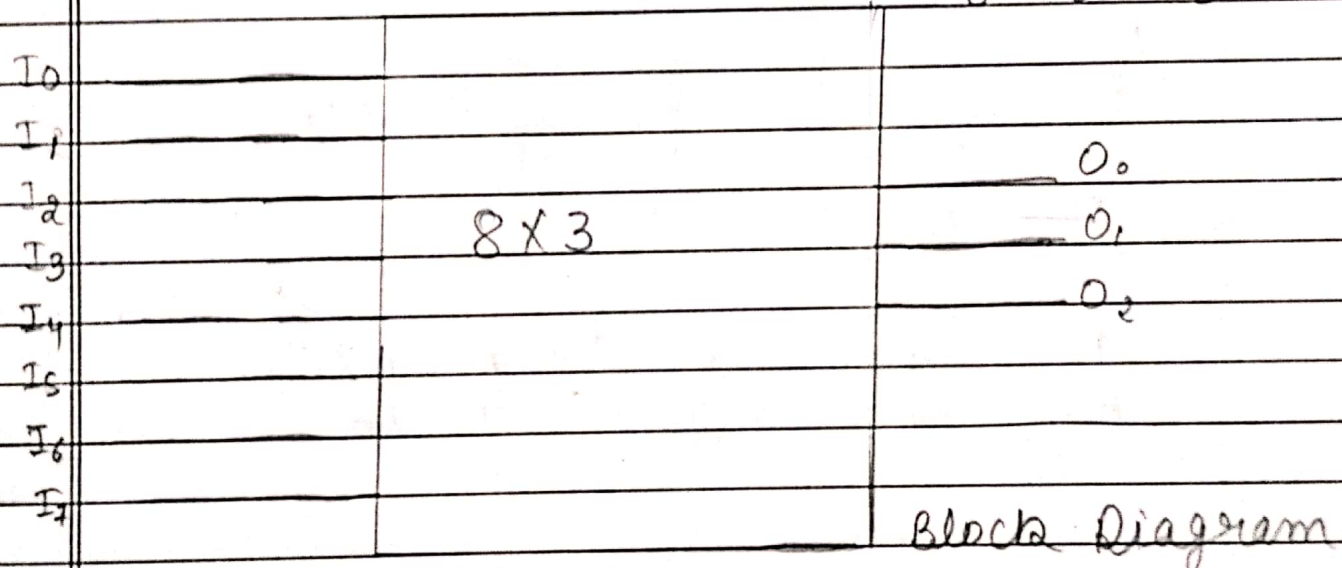
What is encoder?

Encoder is a logic circuit which performs the opposite action of the Decoder. An encoder has a number of input lines, only one of which is activated at a time. At the output is displayes a value corresponding to the activated input. An encoder had 2^n input lines and n output lines.

$$8 = 2^n = 2^3$$



Block Diagram

Types of Encoder:
- Priority Encoder
- Delimal to BCD Encoder
- Octal to Binary Encoder
- Hex to Binary Encoder.

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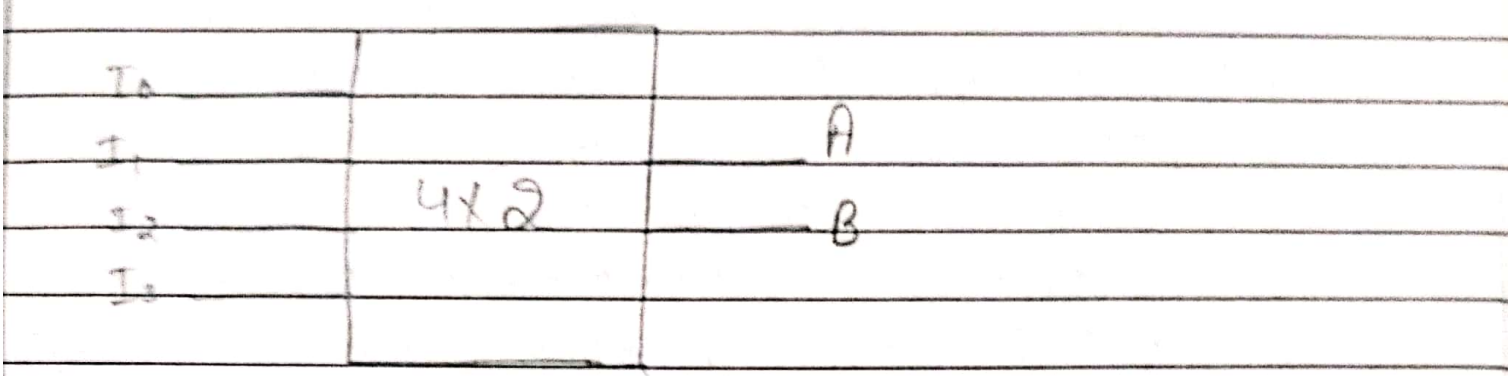
Design 4x2 encoder

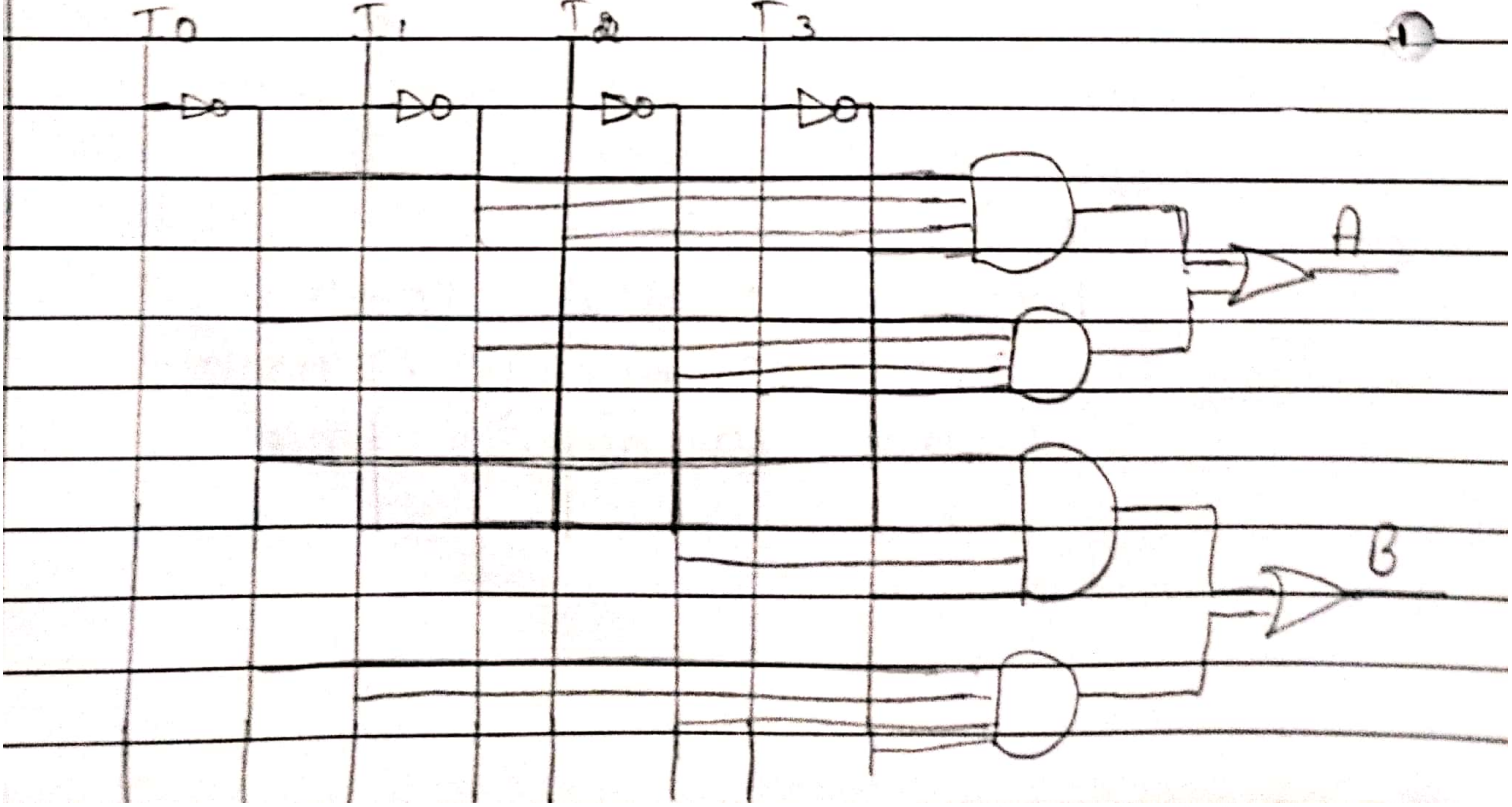


Block diagram

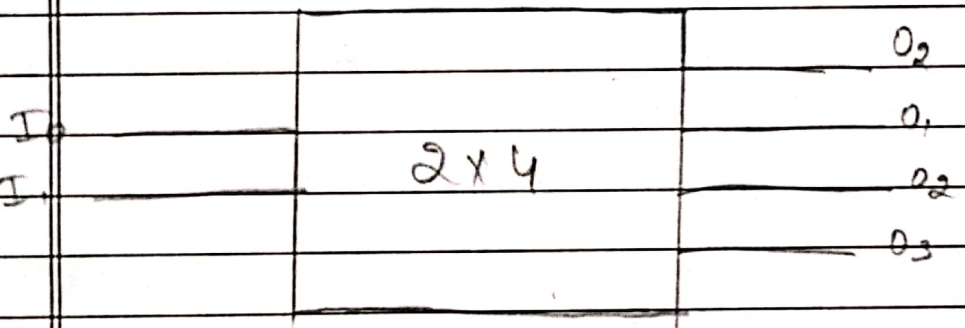
Input				Output	
I_0	I_1	I_2	I_3	A	B
1	0	0	0	0	0
0	1	0	0	0	1
0	0	1	0	1	0
0	0	0	1	1	1

$A = \bar{I}_0 \bar{I}_1 I_2 \bar{I}_3 + \bar{I}_0 \bar{I}_2 I_2 I_3$

$B = \bar{I}_0 I_1 \bar{I}_2 \bar{I}_3 + \bar{I}_0 \bar{I}_1 \bar{I}_2 I_3$



Decoder: A decoder is a logic circuit that accepts a set of inputs that represent a binary number and activated that output which corresponding to the input binary number. A decoder has n inputs and an enable line and 2^n output lines.



Block diagram

Input		output			
I_0	I_1	O_0	O_1	O_2	O_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

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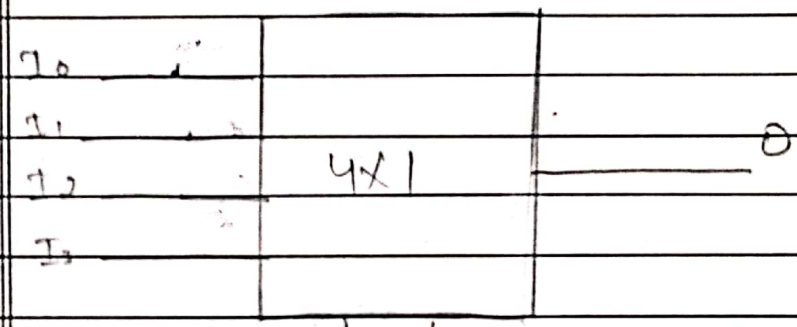
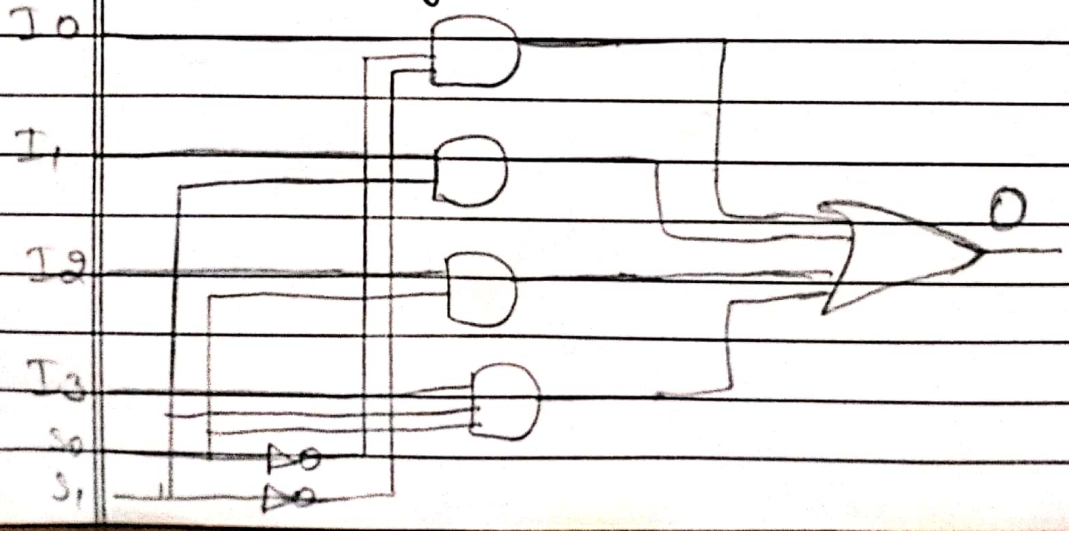
multiplexer: A multiplexer is a logic circuit which accepts many inputs, but select only one input to be passed on to the output. It is sometimes referred to as a data selector, since it selects only one of the inputs. multiplexer is also known as mux.



S0	S1	O
0	0	I0
0	1	I1
1	0	I2
1	1	I3

Logic Diagram



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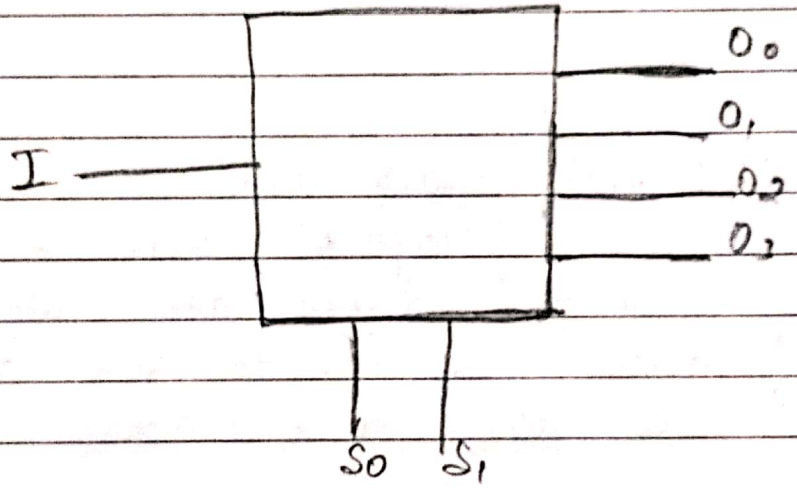
De- multiplexer : A De-multiplexer performs the reverse operation of the multiplexer. It takes one single input and passes this to the output number specified by the select inputs. It is also called as Demux or Data distributor.



S0	S1	Input	outputs
0	0	1	O0
0	1	1	O1
1	0	1	O2
1	1	1	O3

Logic Diagram :

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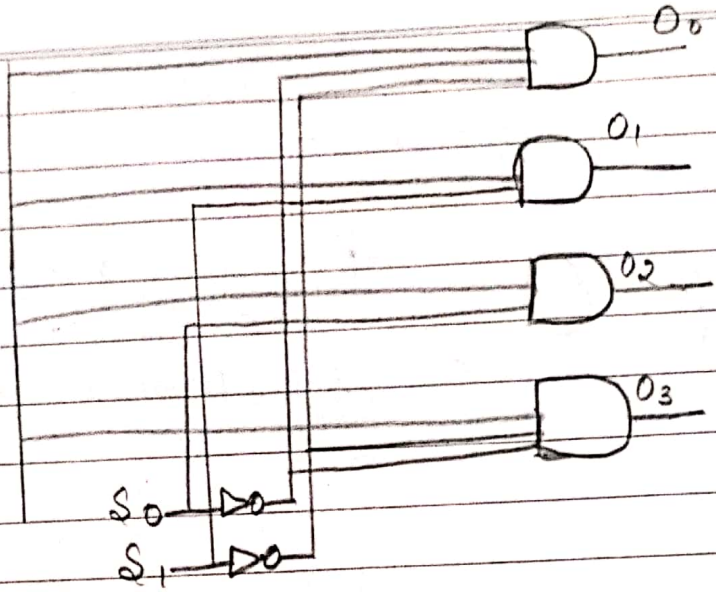
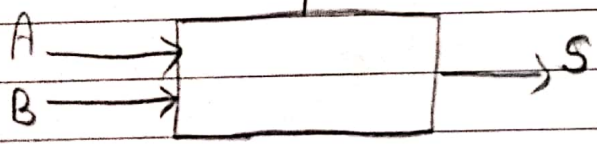


Half Adder: Half adder adds two binary digits and produces two binary outputs called sum and carry. In half adder the inputs are the augend (let's say 'A' and addend 'B'



Input		Sum	Carry
A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Sum

A \ B	0	1
0	0	1
1	1	0

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

Carry

A \ B	0	1
0	0	0
1	0	1

$C = AB$

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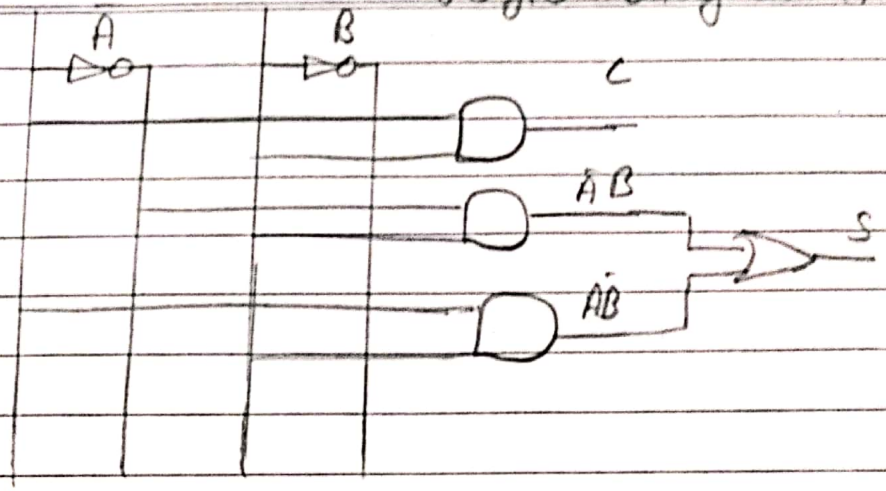
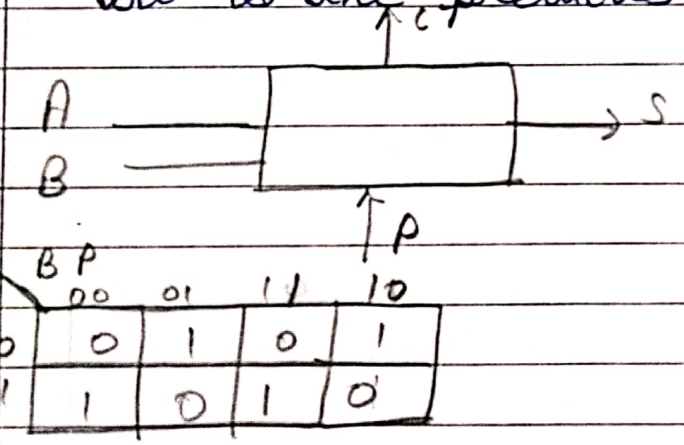
A B - Logic Diagram.



Full ~~Adder~~ Adder:

Half - Adder is a simple circuit but not effective for adding more than two digits. when three bits need to be added, we used a full adder circuit (the third bit is the previous carry bit).



A	B	P	S	C
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

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

Sum

$S = \bar{A}B\bar{P} + \bar{A}B\bar{P} + A\bar{B}\bar{P} + ABP$

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

$A\bar{B}P + ABP$

$AP(B+\bar{B})$

$= AP$

Carry

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$\bar{A}BP + ABP$
$= BP(A+\bar{A})$
$= BP$

$ABP + AB\bar{P}$
$= AB(P+\bar{P})$
$= AB$

$C = AP + BP + AB$

$S = \bar{A}\bar{B}P + \bar{A}B\bar{P} + ABP + A\bar{B}\bar{P}$