Problem 1:

a) Design and implement the following two Boolean function using 4x1 MUXs and necessary gates:

f(P,Q,R,S) = \(\Sigm(0,2,7,10,14,15)\)

Solution:

Truth table:

	P	Q	2 5		-t		
	0	0	0	0	1 1 1		
	0 ,	0	0	1. 0,	0		
	0	0	1	0	1		
	0	0	l .	1	0		
	O		0	0	0		
	0	l .	0	1	0		
	0	J	1	0	0		
		1		l	2		
-		0	0	0	0		
		0	0	1	0		
-		0		0	1		
-		0		1	0		
-			0	0	0		
-		1	0	[0		
	1		l	0	1		
_				1	1		

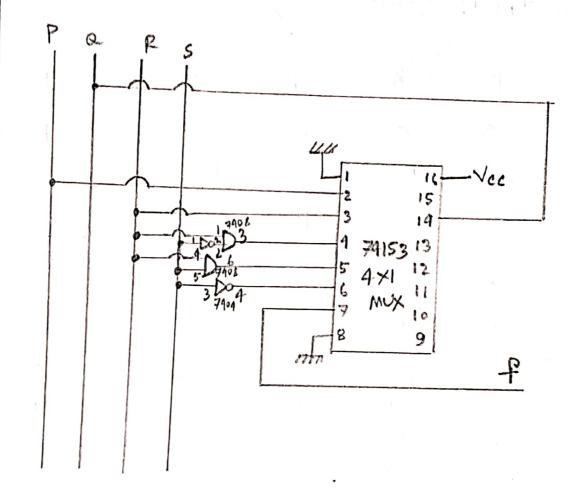
Design and minimization:

			Ý	2	
	25		-	A.	
PR	00	01	11	10	
4	2	,	, ,	16	10=5
00			1	1	
		, .			1 I = RS
01	-		1		1
				The same of the sa	Q
1 11			(1	1)	12 = P
				and the same of	1
P					I2 = P5
10)			1	12 -
			5		

If we use P and R as the selector bits for the 4x1 MUX, then the inputs are:

Io=5, I1=RS, I2=R3 and I3=R

Circuit Diagram:



1.6) Design and implement the following Boolean function using 4x1 MUXS and necessary gates:

f(P,Q,R,S) = M(1,2,3,4,8,9,12)

Solution: Truth table:

P	Q	R	S	f
. 0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	t	1	0
0	1	0	0	0
0		0	1	1
0		1	0	1
0		1	1	1
	0	0	0	0
	0	0	1	0
	0		0	1
	0			1
1		0	0	0
		0	1	1
	1	1	0	1
	1	1		1

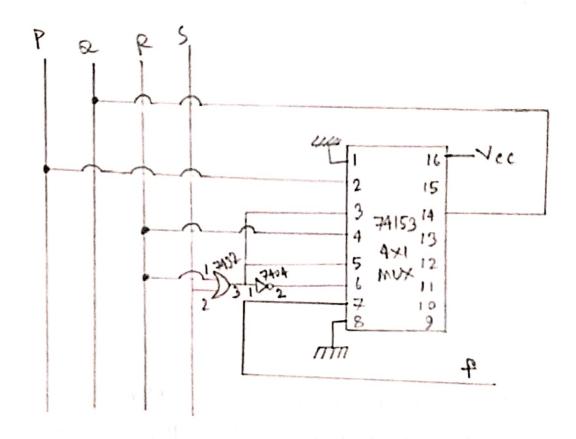
	\ P5			R		
	Pa	00	01	. 11	10	
	00		0	0	0	I. = (S+P)
	01	0	-			Q I, = R+S
) (0				I3 = R+ 5
P	10	0	0		,	I2 = R
	•					

If we use P and as the selector bits for the 4×1 MUX, then the inputs are: $T_0 = (P+S)'$, $T_1 = P+S$, $T_2 = R$ and $T_3 = P+S$

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Circuit Diagram:



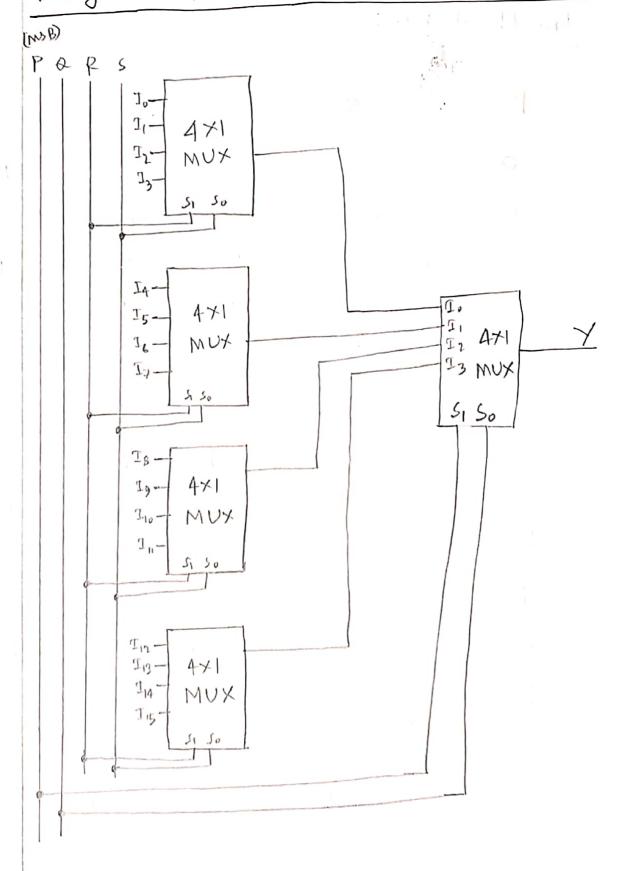
Problem 2

Design a 16×1 MUX using 4×1 MUXs only. Using this 16×1 MUX implement the Boolean function $f(A,\alpha,R,S)$ $= \Sigma(0,2,7,10,14,15)$

Solution: Truth table:

P	0	R	R S	
0	0	0	0	1
0	0	0	1	0.
0	0	1	0	1
0	0	l	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
	0	1	0	1
1	. 0	1	1	0
1	1	0	0	0
1	l	0	l	0
Į.	1	1	0	l
l	ı	1	ı	1

Design of 16 ×1 MUX using 4×1 MUX:



Cincuit diagram:

