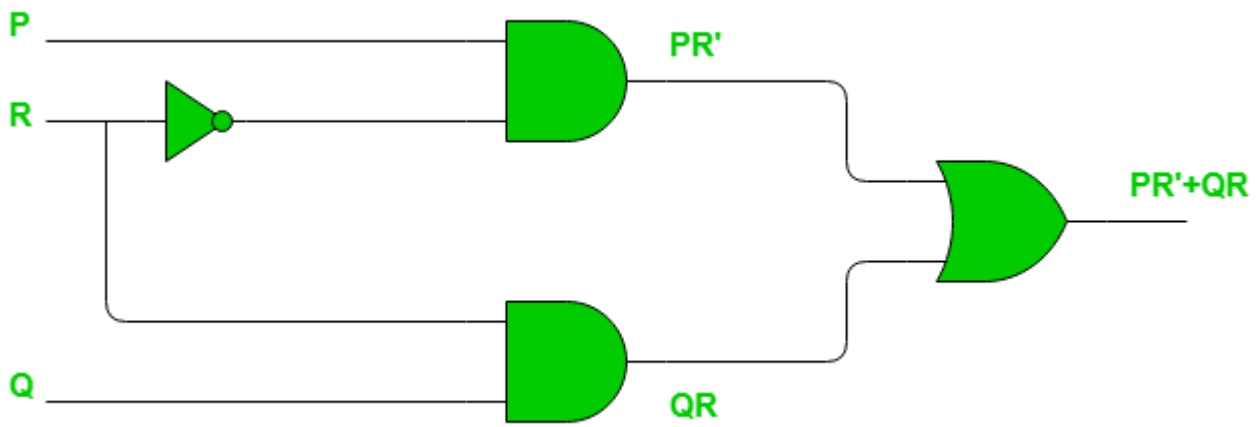
Digital Design
First Semester 2020-21
Tutorial : 06

Design using Decoders and Multiplexers

Digital Design Tutorial : 06

1. Identify hazard in the circuit and eliminate it



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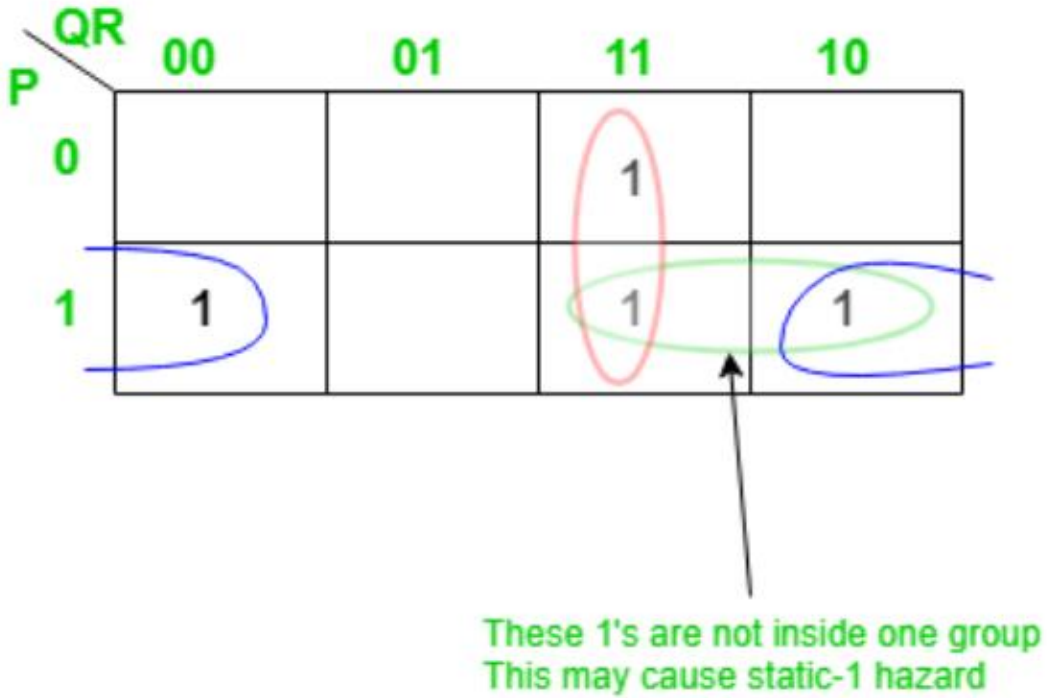
1. Identify hazard Free circuit for

$$F(P,Q,R) = QR + P\overline{R} = \sum m\{3,4,6,7\}$$



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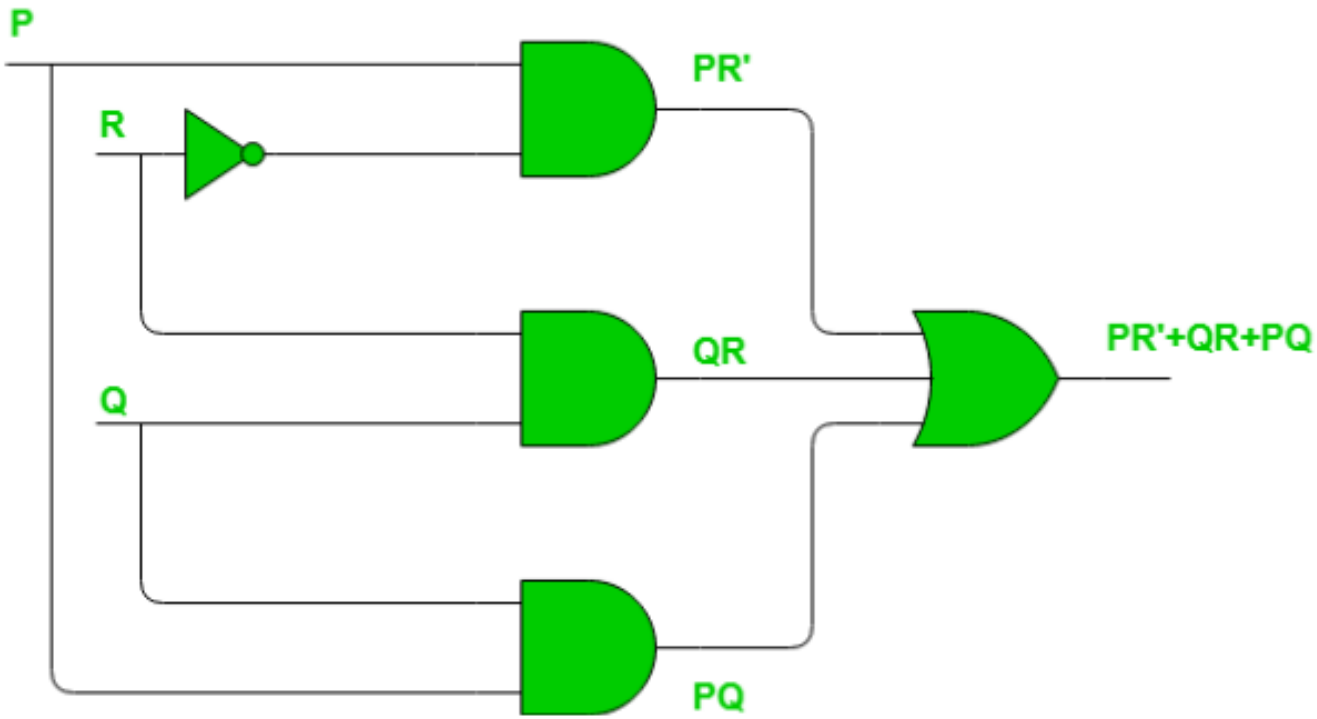

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2 .

Problem: Implement the function $f(w_1, w_2, w_3) = \sum m(0, 1, 3, 4, 6, 7)$ by using a 3-to-8 binary decoder and an OR gate.

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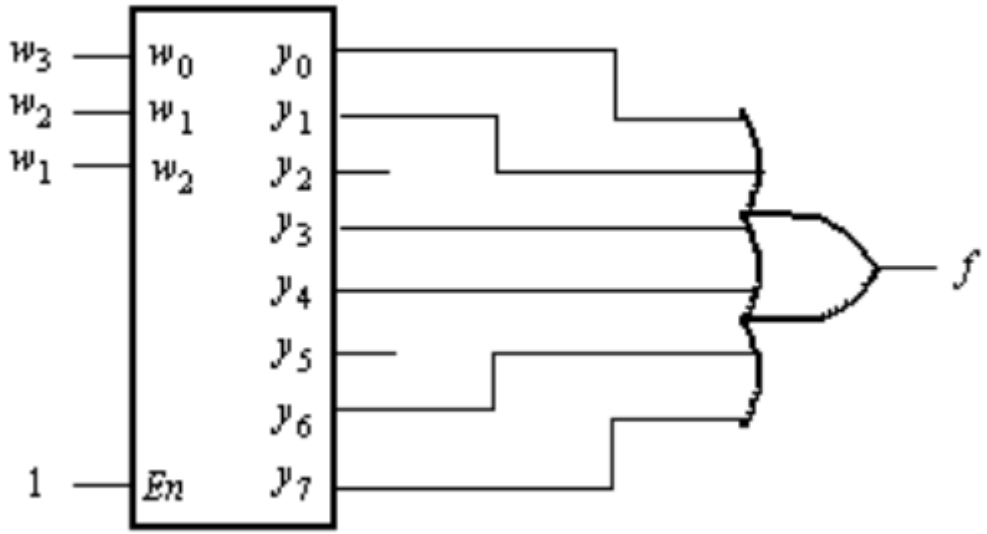

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3. Implement Full Adder Using Decoder

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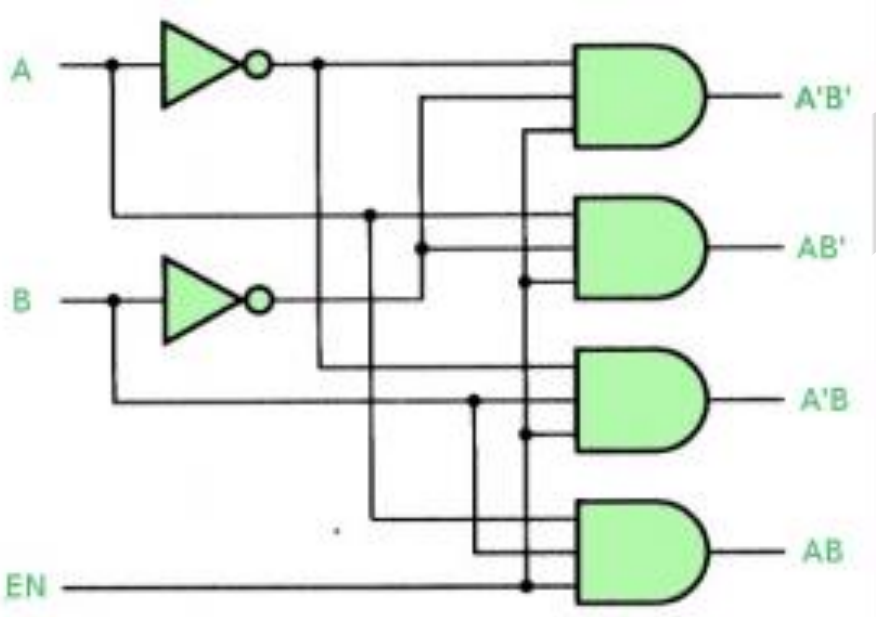
2 to 4 Decoder



Truth Table-

E	A	B	D_0	D_1	D_2	D_3
0	X	X	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1

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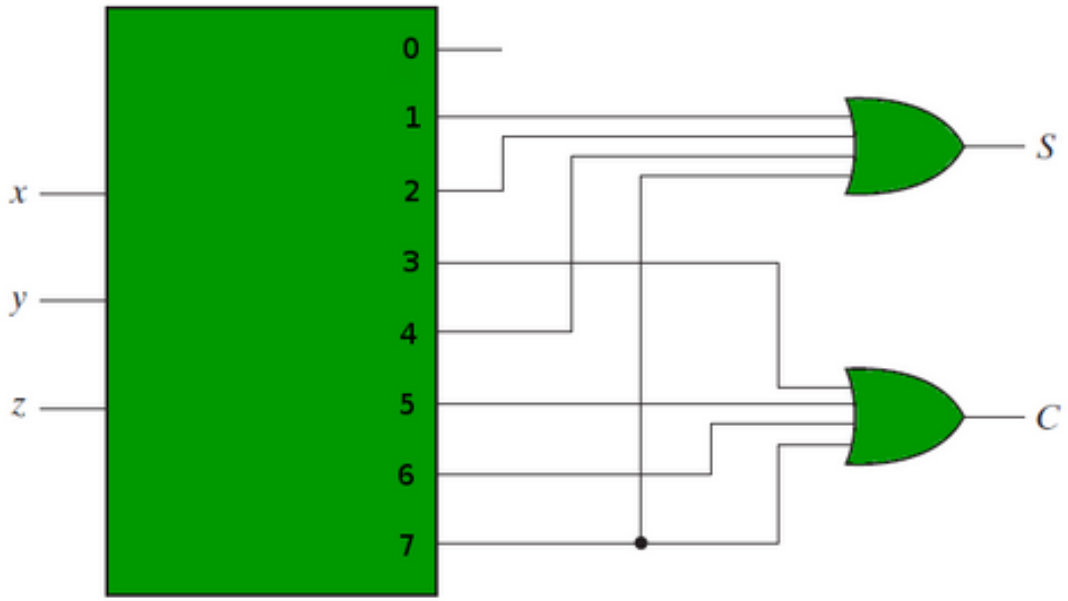
3. Implement Full Adder Using Decoder

x	y	z	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



Therefore we have-

$$S = \sum(1, 2, 4, 7)$$
$$C = \sum(3, 5, 6, 7)$$

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4. Implement F = X’YZ’ + XY’Z + XYZ’ with an 8:1 MUX

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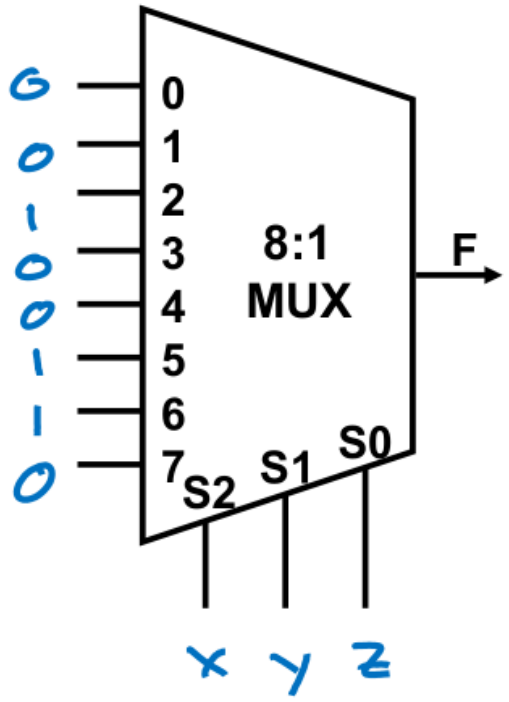
4. Implement F = X'YZ' + XY'Z + XYZ' with an 8:1 MUX

X	Y	Z	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0



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5. Implement F = X'YZ' + XY'Z + XYZ' with a 4:1 MUX

X	Y	Z	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0