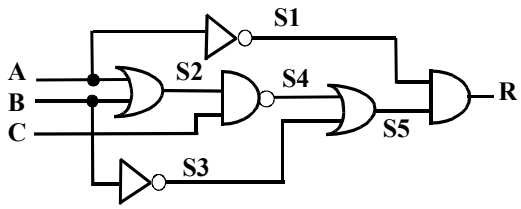
Department of Computing Course 112 - Hardware
Tutorial 3

1.a. A "badly designed circuit" is shown below. Determine its truth table and fill in the K-Map. Note that some entries in the truth table can be filled in by inspection. If A=1 for example then R will be always 0 (why?). Also, if B=0 then the output will be equal to A' (why?).



A B C	S1	S2	S3	S4	S5	R
0 0 0						
0 0 1						
0 1 0						
0 1 1						
1 0 0						
1 0 1						
1 1 0						
1 1 1						

A \ BC	0 0	0 1	1 1	1 0
0				
1				

1.b. What is the Karnaugh Map minimized expression for this circuit?

R = _____

1.c. Draw the circuit:

1.d. What would be the minimum implementation if we knew that the input pattern **011** would never occur? (Modify the K-Map to include "don't cares"). Determine the minimum expression and draw the circuit.

A \ BC	0 0	0 1	1 1	1 0
0				
1				

R = _____

2. The truth table of a four-input one output digital circuit is shown below. Fill in the Karnaugh map, find the minimum expression for it, and draw the circuit.

A	B	C	D	R		A	B	C	D	R
0	0	0	0	1		1	0	0	0	1
0	0	0	1	1		1	0	0	1	1
0	0	1	0	1		1	0	1	0	1
0	0	1	1	1		1	0	1	1	0
0	1	0	0	0		1	1	0	0	0
0	1	0	1	1		1	1	0	1	1
0	1	1	0	0		1	1	1	0	0
0	1	1	1	0		1	1	1	1	0

		CD			
		00	01	11	10
AB	00				
	01				
	11				
	10				

. .

3. A circuit is designed for binary coded decimal input processing. This means that four bits are used for input but only **ten** of the possible sixteen input combinations are used. (There are **six** don't cares which can be selected as desired). The circuit output must be a **1** whenever there are exactly three inputs at **1** and the remaining input is **0**. All other outputs can be either 0 or don't care. Make a choice of the six don't cares in order to find the minimum circuit.

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		CD			
		00	01	11	10
AB	00				
	01				
	11				
	10				