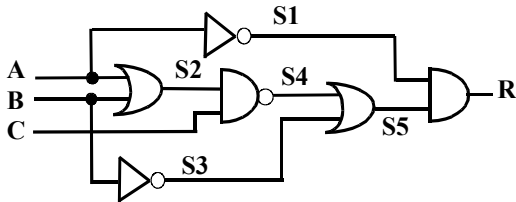


## Department of Computing Course 112 - Hardware Tutorial 3

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						

		BC			
		00	01	11	10
A	0				
A	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.

		BC			
		00	01	11	10
A	0				
A	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.

		CD			
		00	01	11	10
AB	00				
	01				
	11				
	10				