Department of Mechanical, Materials and Manufacturing Engineering

The University of Nottingham

Electromechanical Devices MMME2051

Exercise Sheet 6 – Digital Electronics 1

6.1 Define in words the difference between electronic and electrical engineering.

6.2 Represent the following numbers using an 8-bit binary code:

a. 25
b. 1
c. 100
d. 255
e. 170
f. 8
g. 40

6.3 Write the numbers from 1 to 15 in binary.

6.4 How many binary digits would you need to represent the following numbers:

a. 1000
b. 50
c. 40
d. 1,000,000
e. 7000

Hint: You can either do this question by using the formula 2n-1 and keep increasing the value of n until you get a number just bigger than you need to store the desired value. Or you can use log rule and write $log_{10}(number)/log_{10}(2)$ this will tell you how many binary digits you will need, round the number up and that's your answer. Try both methods!

6.5 Using binary code how high can you count on your fingers?

6.6 Write out the truth table for the following gates:

a. AND
b. OR
c. NOT
d. NAND

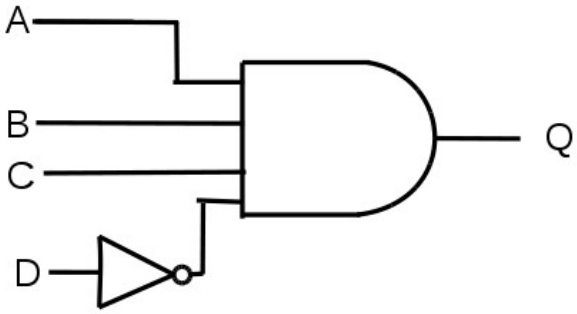
e. NOR
f. XOR

6.7 Sketch the gate symbols with all inputs and outputs showing.

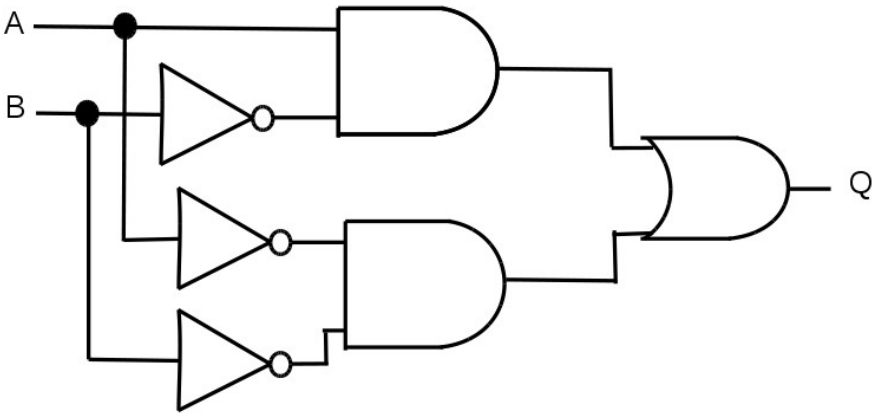
6.8 Draw the truth table of the following circuits:

a.

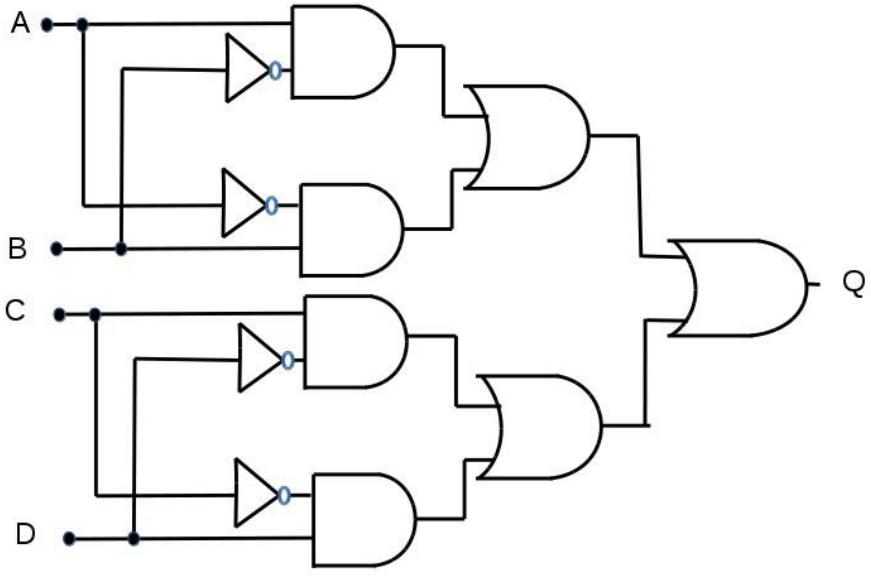
b.



c.



d.



6.9 Construct a digital circuit to accept a two bit binary number and produce a 1 if the number is even and a zero if the number is odd. Start by writing out the truth table for the circuit.

6.10 Construct a digital circuit that will accept a 3-bit binary number and produce a 1 if the number is even and a zero if the number is odd. Start by writing out the truth table for the circuit.

6.11 Construct a circuit that will accept a 4-bit binary number and will produce a 1 if the number is prime and a 0 if the number is non-prime. Start by writing out the truth table for the circuit.