



Worksheet 1 – MM2EMD Fundamentals of digital electronics

Q1. Define in words the difference is between electronic and electrical engineering.

Q2. Represent the following numbers using an 8 bit binary code

a) 25

b) 1

c) 100

d) 255

e) 170

f) 8

g) 40

Q3. Write the numbers from 1 to 15 in binary.

Q4. 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 $2^n - 1$, 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 $\log_{10}(\text{number}) / \log_{10}(2)$ this will tell you how many binary digits you will need, round the number up and that's your answer. Try both methods!

Q5. Using binary code how high can you count on your fingers?

Q6. Draw a diagram shaft encoder which uses only one LED and one sensor. Name two possible applications for a shaft encoder.

Q7. Draw the disk of a shaft encoder which has three sensors and 8 positions.

Q8. Write out the logic table for the following gates:

a) AND gate

b) OR gate

c) NOT gate

Now sketch the gates with all the inputs and outputs showing.

Roderick MacKenzie 16/02/15

Q1. Electrical Engineering usually involves using large currents or voltages to do useful work. Electronic engineering involves using low voltages and currents in circuits which make decisions.

Q2.

- a) 00011001
- b) 00000001
- c) 01100100
- d) 11111111
- e) 10101010
- f) 00001000
- g) 00101000

Q3.

- 0 0000
- 1 0001
- 2 0010
- 3 0011
- 4 0100
- 5 0101
- 6 0110
- 7 0111
- 8 1000
- 9 1001
- 10 1010
- 11 1011
- 12 1100
- 13 1101
- 14 1110
- 15 1111

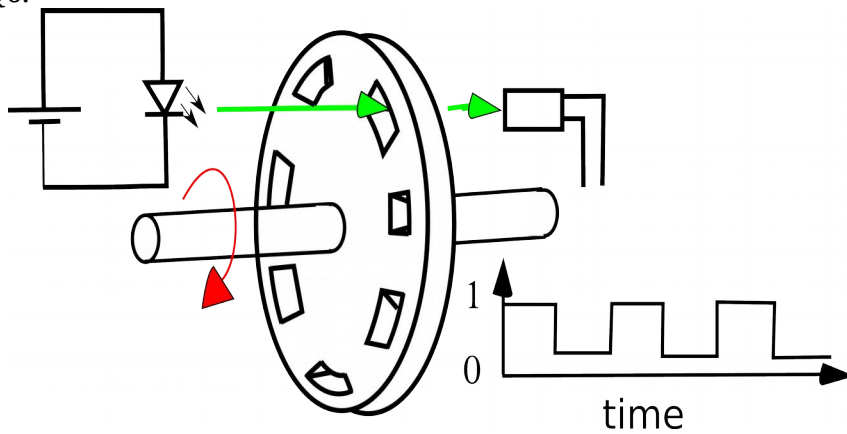
Q4.

- a) 10
- b) 6

- c) 6
- d) 20
- e) 13

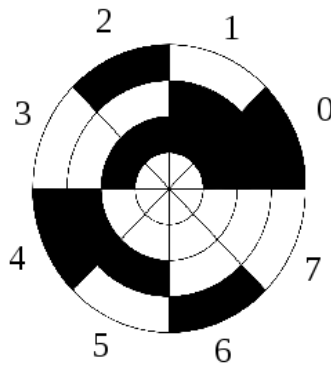
Q5. 1023 or 1024 (if you include 0!)

Q6.



Applications: a) In a robot arm, b) in a wheel of a car.

Q7.



Q8.

a) AND gate

A B Q

0 0 0

0 1 0

1 0 0

1 1 1

b) OR gate

A B Q
0 0 0
0 1 1
1 0 1
1 1 1

c) NOT gate

A Q
0 1
1 0

For the pictures of the gates see the lecture notes.