زانکۆی گەشەپێدانی مرۆیی
UNIVERSITY OF HUMAN DEVELOPMENT

DIGITAL ELECTRONICS LABORATORY

Experiment No.1

Part (II)

THE APPLICATION OF EXCLUSIVE- OR

Object:

The EX – OR is a widely used function because of special arithmetic properties which will be discussed below and because of its wide applications.

THEORY:

1- Parity checker:

Errors can occur as digital codes are being transferred from one point to another within a digital system or while codes are being transmitted from one system to another.

The errors take the form of undesired changes in the bits that make up the coded information: that is a 1 can change to a 0 or a 0 to 1.due to component many function or electrical noise.

If we have four bit word, to detect the occurrence of an odd number of errors in this word. A single bit will be added to the word that make the number of ((ones)) in the word either even number (even parity) or odd number (odd parity), so if an odd number of errors occurred in the word, then the total number of ones will not remain the same, it will change from odd to even or from to odd.

The EX – OR gate is the most suitable circuit to provide parity checker. Fig. (10) given the circuit of four bit even parity checker.

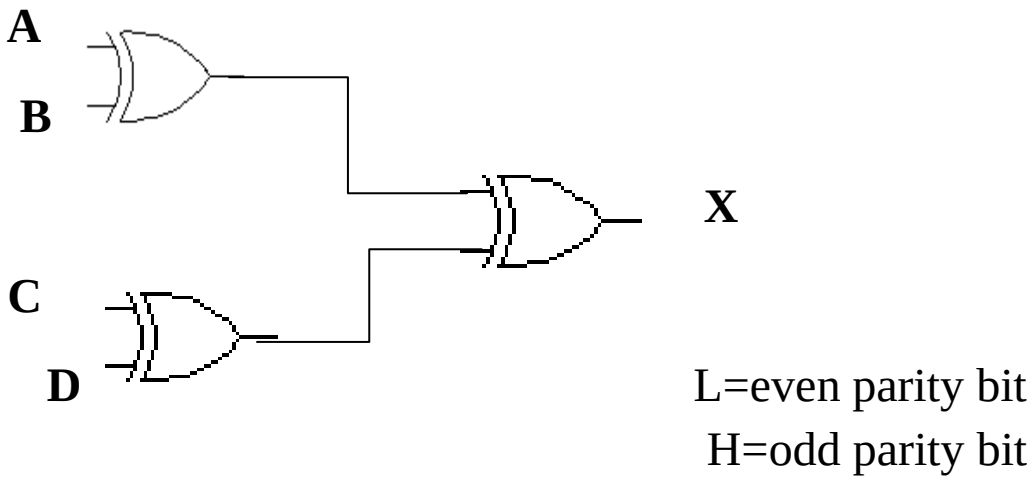


Fig. (10) four bit parity checker.

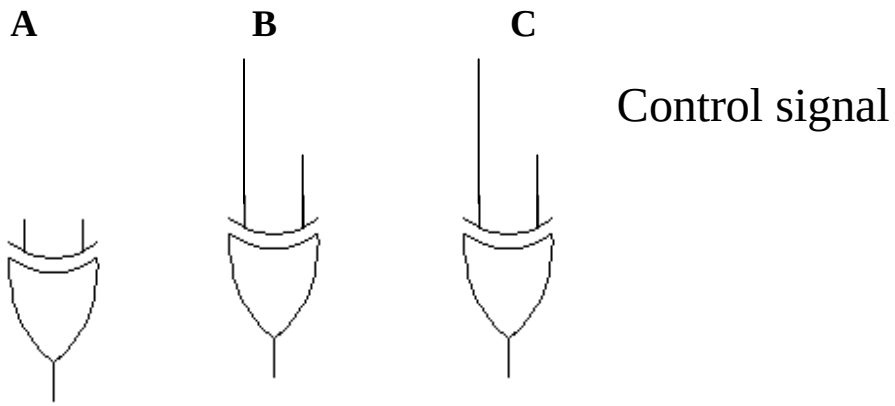
2- Control inverter:

We can use the EX – OR gate as a (NOT) gate by connecting one of the inputs to logic 1. For this reason it can be used to complement a word by using one of the inputs as control line as show in Fig (11).

When control line as show is logic zero then

A=X, B=Y, C=Z, when control signal is logic one then

X=Ā, Y=B, Z=Ć.



X Y Z

Fig. (11) Control inverter logic circuit.

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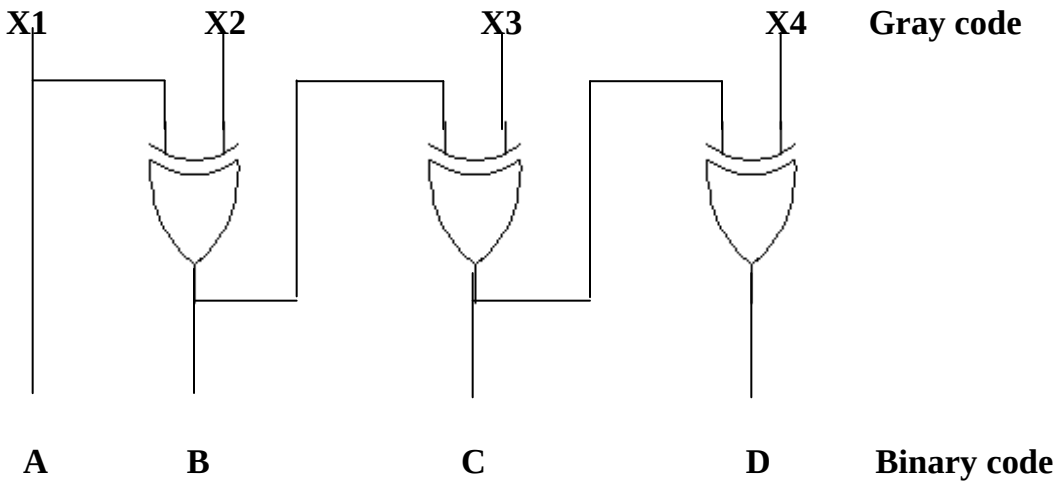
3- Binary to Gray/ Gray to Binary conversion:

The gray code is widely used in many digital systems specially in shaft encoders and analog to digital converter, but it is very difficult to use the gray – code in arithmetic operations, since there are only one bit change between any two consecutive gray code number, and it is un weighted code, and the EX-OR gate is the most suitable gate for this purpose as show in Fig. (12):

A)



B)

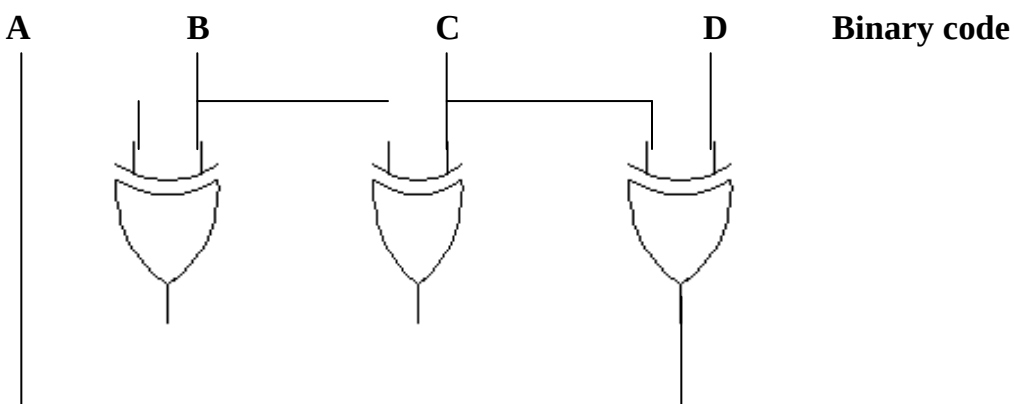


Fig. (12) (A) Gray to binary converter

(B) Binary to gray code converter

4- Digital Comparator:

The basic function of a comparator is to compare the magnitudes of two quantities in order to determine the relationship of those quantities. In its simplest form a comparator circuit determines if two numbers are equal.

The EX – OR gate is a basic comparator because its output is a 1 if its two input bits are not equal and a 0 if the input are equal.

If the comparison is such that the states of one number with respect to the other is to be specified one of the three conditions A>B, A<B, or A=B.

A	B	A > B	A < B	A = B
0	0	0	0	1
1	0	1	0	0
0	1	0	1	0
1	1	0	0	1

Table (1) comparator of two numbers of each one bit.

Procedures:

1- Connect the circuit shown in Fig. (10) Find the even parity bit and add parity bit for each number.

2- Connect the circuit shown in Fig. (11) And check the result when the control signal is 1, then when the control signal is 0.
3- Connect 3 bit gray to binary converter-circuit and find the equivalent binary for the following gray code 110,111,101, and 001.

Then connect 3 bit binary to gray code converter-circuit and find the equivalent gray code for the following binary number 011, 000, 010, and 111.

4- Referring to the truth table (1) shown in theory design the circuit for two bit comparator.

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Discussion:

1- Is the gray code arithmetic code? Why? Where does this code used?
2- What is the parity bit? And what will be for even parity and odd parity?
3- Design eight-bit odd parity checker?
4- What is the application of the comparator?
5- A burglar alarm for a car has a normally low (grounded) switch on each of four doors. If any door is open the output of that switch goes high.
The alarm is set off with an active-low output signal. What type of gate will provide this logic?

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