Lecture Six: **Boolean algebra :**

Boolean variable is a quantity that is either (1) or (0) .

Boolean algebra is a mathematical method to manipulate Boolean variable in order to simplify the Boolean equation .

There are three basic operation in Boolean algebra :

1- OR (logical addition) (+)

2- AND (logical multiplication) (.)

3- NOT (logical inversion) ( )

**Gate :**

It is a device with one output and two or more inputs . output is related to the input in Boolean (logic) equation .

In the following , the basic logic gates with their symbols , truth table and equation :

**Gate Symbol Truth table Equation**

AB Z

00 0

01 1

OR A Z 10 1 Z=A+B

B 11 1

AB Z

00 0

01 0

AND A Z 10 0 Z=A.B

B  11 1

A Z

0 1

NOT A Z  1 0 Z=A

AB Z

00 1

01 1

NAND  A Z10 1 Z=A.B

B  11 0

AB Z

00 1

01 0

NOR A  Z  10 0 Z=A+B

B  11 0

AB Z

00 0

01 1

EX\_OR A  Z 10 1 Z=A ⊕ B

B 11 0

AB Z

00 1

01 0 Z=A⊕ B

EX\_NOR A Z  10 0

B 11 1

***EX***: Describe the T.T. for three input OR- gate :

ABC Z

000 0 A

B Z  001 1

C  010 1

011 1

100 1

101 1

110 1

111 1

***EX***: Describe the T.T for the following logic circuit :

A ABC Z

B  000 1

Z  001 0

C  010 1

011 0

100 1

101 0

110 1

111 1

***H.w.***: Describe the T.T for the following :

A

A  B

B Z C Z

c

A A

B B  Z

C Z

D