Government Polytechnic Jalgaon

Academic Year 2019-20

Course Code

Digital Techniques(22230)

EJ 3 I.

TITLE

To study Design And Implementation Of Half Adder And Half Subtractor.

Submmited By :-

1. Prathamesh Saraf (13)
2. Rohit Koli (14)
3. Tushar Rathod (15)
4. Hiten Mahajan (16)

Under the guidance of:

MR C.R.bharhate(sir)

Rational :-

In the present scenariomost of the electronics equipment like computers , mobiles , music systems , ATM , automation and control circuit and systems are based on digital circuit which the diploma electronics engineering passout (also called technologists) have to test them .

The knowleged of basic logic gate , combinational and sequencial logic circuits using discrete gates well as digital ics will enable the student to interpreat the working of equipment and maintain them. After completion of the course , students will be able to develop digital circuits based application .

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
Certificate

This is to certify that Mr/Ms.**Prathamesh, Rohit , Tushar , Hiten ,** Roll No.**13,14,15,16** Of **3rd** Semester of Diploma in **E&TC.** of Institute, **Government Polytechnic, Jalgaon** (Code:0018/1567) has completed the **Micro Project** satisfactorily in the Subject – **digital electronic (22320)** for the Academic Year 2019- 2020 as prescribed in the curriculum.

Place**: Jalgaon** Enrollment No:-

1800180265,1800180….,1800180….. , 1800180…. , 1800180……

Date:-

Exam. Seat No:-

Subject Teacher **Head of the Department** **Principal**

Seal of Institution

Subtractor :-

The subtractor of two binary numbers can be done by taking the complement of the subtrahend and adding it to minuend .

The rules of subtracor of binary subtraction are as follows:

0 – 0 = 0

0 – 1 = 1 (borrow=1)

1 – 0 = 1

1 – 1 = 0

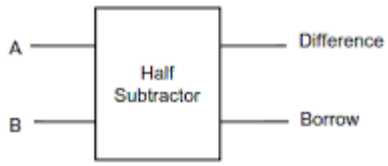
There are two types of binary subtractors :

1 Half subtractor
2 Full subtractor

1 Half subtractor :-

The half subtractor is a combinational circuit with two inputs and two outputs.

Block diagram:-

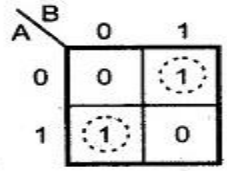


Truth table :-

Half Subtractor-Truth Table			
Input		Output	
A	B	Difference	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

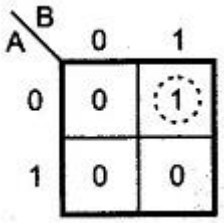
K map:-

1 For difference :-



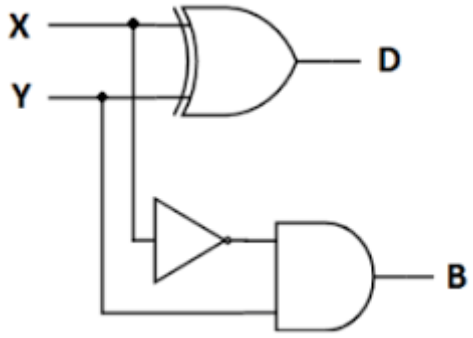
$$\text{Difference} = A\overline{B} + \overline{A}B$$
$$= A \oplus B$$

2 For borrow :-



$$\text{Borrow} = \overline{A}B$$

Logic diagram :-



Application of Half Subtractor:-

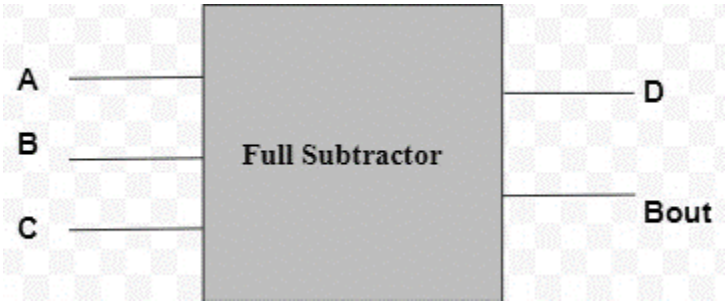
The applications of half subtractor include the following.

- Half subtractor is used to reduce the force of audio or radio signals
- It can be used in amplifiers to reduce the sound distortion
- Half subtractor is used in ALU of processor
- It can be used to increase and decrease operators and also calculates the addresses
- Half subtractor is used to subtract the least significant column numbers. For subtraction of multi-digit numbers, it can be used for the LSB.

2. Full subtractor

The full subtractor is a combination circuit which performs subtraction between two bits considering that a 1 has been borrowed from the previous stage.

Block diagram:-



Truth table :-

Input			Output	
A	B	C	Difference	Borrow
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

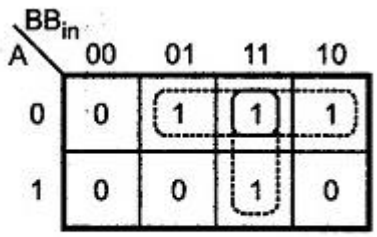
Kmap:-

For difference :-

A \ BB_{in}	00	01	11	10
0	0	(1)	0	(1)
1	(1)	0	(1)	0

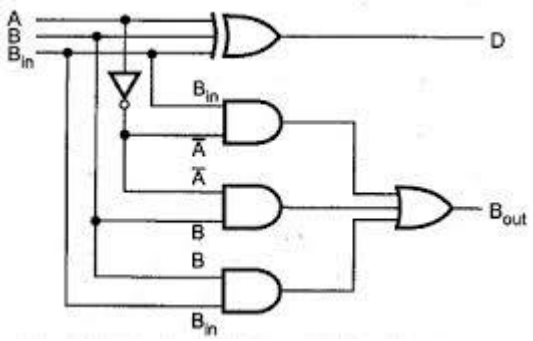
$$D = \bar{A}\bar{B}B_{in} + \bar{A}B\bar{B}_{in} + A\bar{B}\bar{B}_{in} + ABB_{in}$$

For barrow:-



$$B_{out} = \overline{A}B_{in} + \overline{A}B + BB_{in}$$

Logic diagram



Application of full subtractor :-

- These are generally employed for ALU (Arithmetic logic unit) in computers to subtract as CPU & GPU for the applications of graphics to decrease the circuit difficulty.
- Subtractors are mostly used for performing arithmetical functions like subtraction, in electronic calculators as well as digital devices.
- These are also applicable for different microcontrollers for arithmetic subtraction, timers, and program counter (PC)
- Subtractors are used in processors to compute tables, address, etc.
- It is also useful for DSP and networking based systems.