# “SEVEN SEGMENT DISPLAY”

A course project report submitted

in partial fulfilment of requirement for the completion of

**digital electronics course**

By

Group-2


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## INTRODUCTION:

The objective is to convert BCD code to seven segment decoder. A 7 segment display is made of seven different illuminating segments. These are arranged in a way to form numbers and characters by displaying different combinations of segments. The binary information is displayed using these seven segments. LED's or LCD's are used to display the required numeral or alphabet.

It is an combinational circuit that converts decimal digit in BCD to an appropriate code for the selection of segments in an indicator used to display decimal digit. In BCD (Binary Coded Decimal), a binary pattern is used to represent a decimal number. A seven segment display is used to display hexadecimal numeral by seven LEDs arranged in a definite pattern.

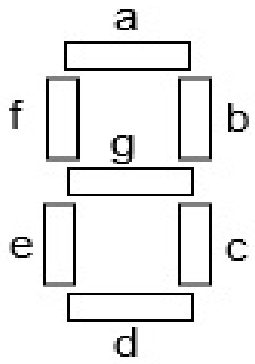
In Binary Coded Decimal (BCD, each of the decimal numbers (0-9) is represented by its equivalent binary pattern (which is generally of 4-bits). Seven segment display is an electronic device which consists of seven Light Emitting Diodes (LEDs) arranged in a definite pattern, which is used to display Hexadecimal numerals (in this case decimal numbers, as input is BCD i.e., 0-9).

## DESIGN OVERVIEW:

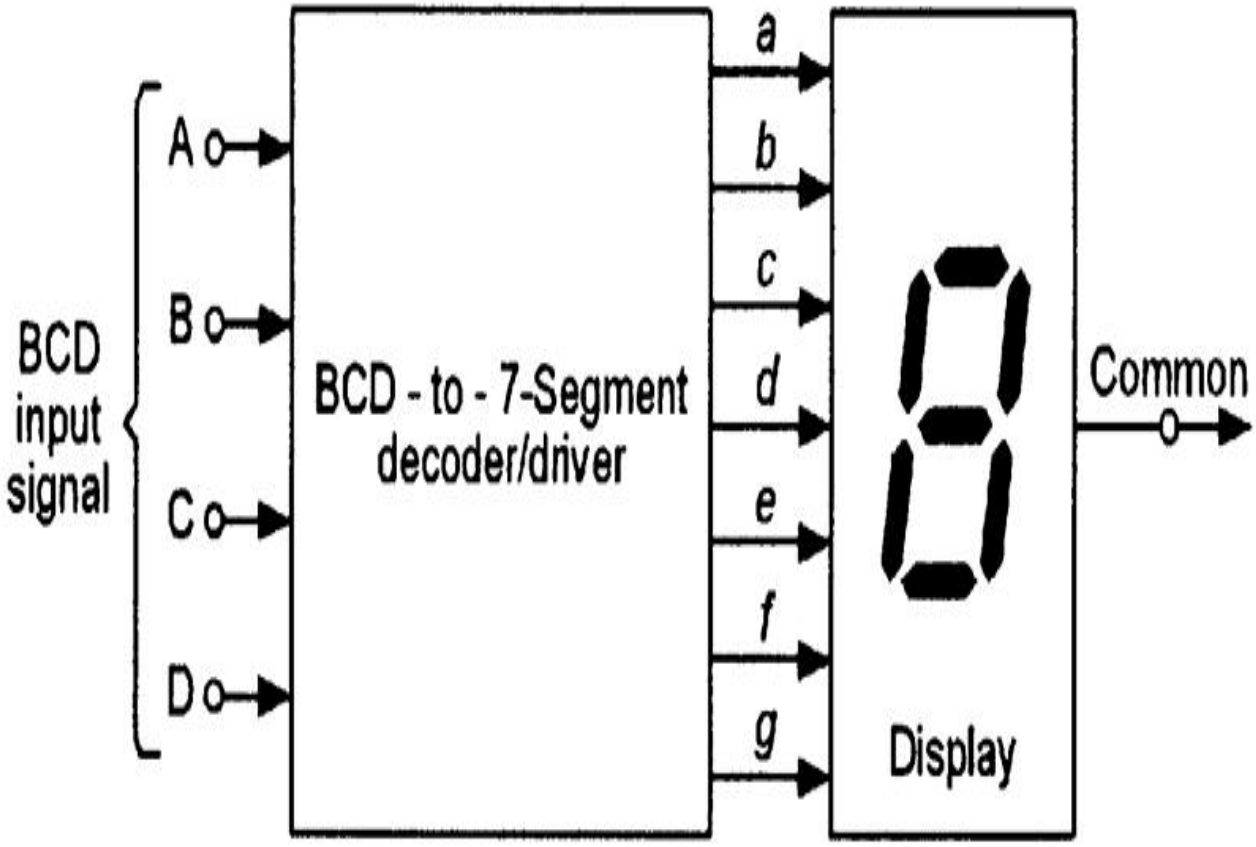
Seven segment displays are the output display device that provide a way to display information in the form of image or text or decimal numbers which is an alternative to the more complex dot matrix displays. It is widely used in digital clocks, basic calculators, electronic meters, and other electronic device that display numerical information. It consists seven segments of light emitting diodes (LEDs) which is assembled like numerical 8.

This project introduces how to use a 7-segment display using only LED's a battery, a breadboard, a resistor,IC's and some wires.

We have used quad and gates ,quad or gates, and hex inverter and LED's for the display.In decoder ,we have placed logic gates and seven segments of light emitting diodes (LEDs) which is assembled like numerical 8 is done using LED's.



## SYSTEM ARCHITECTURE DESIGN:




## SYSTEM ARCHITECTURE DESCRIPTION:

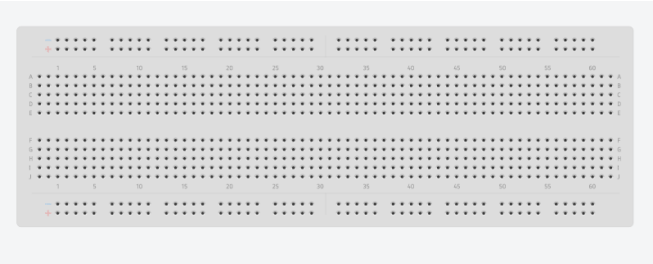
A 7-segment display is an electronic device that can be used for displaying numerals and some letters. Different letters/numbers can be represented by connecting different pins on the display to the battery, which turns on the LEDs in parallel. It consists of 8 LEDs connected in parallel that can be lit in different combinations to display the numbers (0, 1, 2, 3, 4, 5, 7, 8, 9, A, b, C, d, E, F, etc.).each segment (LED) is denoted by letters a to g.

The number 8 is displayed when the power is given to all the segments and if you disconnect the power for ‘g’, then it displays number 0. In seven segment display, power at different pins can be applied at the same time, so we can form combinations of display numerical from 0 to 9. Since seven segment display can be used only for displaying decimal numerical magnitudes.

## DESCRIPTION OF COMPONENTS:

The components used in this project are breadboard, power supply, LED'S, dip switch, connecting wires, quad and gate, quad or gate, hex inverter.

### Bread board



A breadboard/protoboard, is used for prototyping of electronics. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solderless breadboards are also popular with students and in technological education. A breadboard is an electronic tool which can be used to test electrical circuits. Instead of using soldering to connect wires and components together ,they can be stuck into the holes of the breadboard. It has metal strips inside that will connect them, and it lets them be removed easily or moved around when testing a circuit.

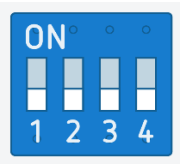
The rows and columns of holes on a breadboard are usually labelled with numbers and letters. Everything in a row with the same number will be connected, except if the breadboard has a strip down the center.

### Power supply

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices.

Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

## DIP switch




A DIP switch is a manual electric switch that is packaged with others in a group in a standard dual in-line package (DIP). The term may refer to each individual switch, or to the unit as a whole. This type of switch is designed to be used on a printed circuit board along with other electronic components and is commonly used to customize the behavior of an electronic device for specific situations.

DIP switches are an alternative to jumper blocks. Their main advantages are that they are quicker to change and there are no parts to lose.

## LED’S

A LED (light-emitting diode) converts electrical energy to light by means of a semiconductor, made of a solid material, such as silicon, whose electrical conductivity when hot is as great as that of metals and very low when cold. LEDs were commonly referred to early in their history as solid-state lamps. The light

produced by LEDs is known as electroluminescence, distinguishing it from incandescence, which is characteristic of light bulbs.

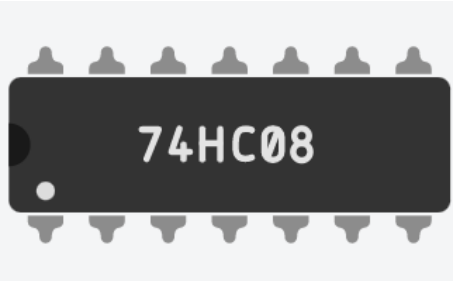
## Connecting wires

Connecting wires allows an electrical current to travel from one point on a circuit to another, because electricity needs a medium through which to move. wires are embedded into circuit boards, carrying pulses of electricity that are interpreted as binary signals of zeros and ones.

## Hex inverter

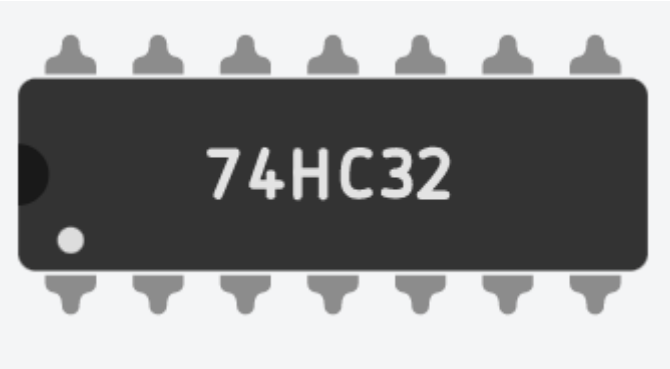

The 74HC04 is a hex inverter IC, meaning it has 6 inverted (NOT Gates) inside it of which each NOT gate can perform independently on its own. NOT gates are very useful in building Logic Combinational Circuits; they can also work independently as a Wave oscillator or as a Buffer IC. Since the IC package has 6 Gates inside it, the connections get compact and the response of all 6 gates is almost identical making it more reliable.

## Quad And gate




74HC08 is Quad 2-Input AND Gate 14 Pin IC. The 74HC08 provides 4 independent 2-input AND gates with standard push-pull outputs. The device is designed for operation with a power supply range of 2.0V to 6.0V. It utilize advanced silicon-gate CMOS technology to achieve operating speeds similar to LS-TTL gates with the low power consumption of standard CMOS integrated circuits. The HC08 has buffered outputs, providing high noise immunity and the ability to drive 10 LS-TTL loads. The 74HC logic family is functionally as well as pin-out compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to VCC and ground.

## Quad or gate




The 74HC32 provides provides four independent 2-input OR gates with standard push-pull outputs. The device is designed for operation with a power supply range of 2.0V to 6.0V. The gates perform the Boolean function: Y = A + B .

**TRUTH TABLE:**

| No. | A | B | C | D | a | b | c | d | e | f | g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 3 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 4 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 5 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 6 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 7 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 8 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

**BOOLEAN EXPRESSIONS:**

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | | 1 | 1 |
| $\bar{A}B$ | | 1 | 1 | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$a=\bar{A}C+\bar{A}BD+\bar{B}\bar{C}\bar{D}+A\bar{B}\bar{C}$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | 1 | 1 | 1 |
| $\bar{A}B$ | 1 | | 1 | |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$b=\bar{A}\bar{B}+\bar{A}\bar{C}\bar{D}+\bar{A}CD+\bar{B}\bar{C}$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | 1 | 1 | |
| $\bar{A}B$ | 1 | 1 | 1 | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$c=\bar{A}B+\bar{B}\bar{C}+\bar{A}CD$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | | 1 | 1 |
| $\bar{A}B$ | | 1 | | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$d=\bar{A}C\bar{D}+\bar{A}\bar{B}C+\bar{B}\bar{C}\bar{D}+A\bar{B}\bar{C}+\bar{A}\bar{B}\bar{C}D$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | | | 1 |
| $\bar{A}B$ | | | | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | | | |

$e=\bar{A}C\bar{D}+\bar{B}\bar{C}D$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | | | |
| $\bar{A}B$ | 1 | 1 | | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$f= \bar{A}B\bar{C} +\bar{A}\bar{C}\bar{D}+\bar{A}BD+A\bar{B}\bar{C}$

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | | | 1 | 1 |
| $\bar{A}B$ | 1 | 1 | 1 | 1 |
| $AB$ | | | | |
| $A\bar{B}$ | 1 | 1 | | |

$g=\bar{A}C+\bar{A}B+A\bar{B}\bar{C}$

**RESULTS:**

If the input is one, output is a = 1, b = 1, c = 1, d = 1, e = 1, f = 1 and g = 0.

If the input is one, output is a = 0, b = 1, c = 1, d = 0, e = 0, f = 0 and g = 0.

If the input is two, output is a = 1, b = 1, c = 0, d = 1, e = 1, f = 0and g = 1.

If the input is three, output is a = 1, b = 1, c = 1, d = 1, e = 0, f = 0and g = 1.

If the input is four, output is a = 0, b = 1, c = 0, d = 0, e = 1, f = 1and g = 1.

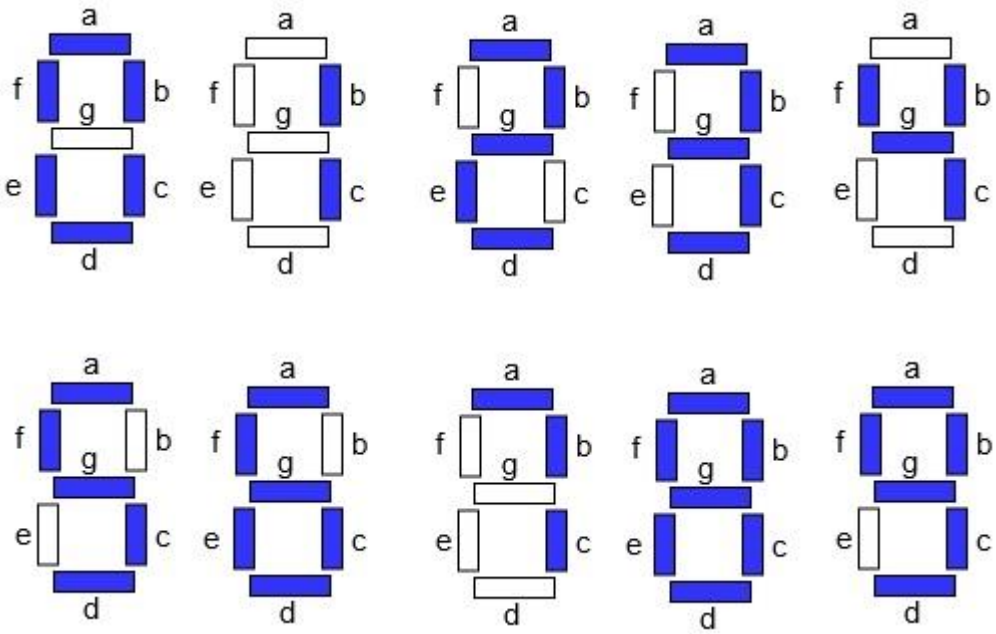
If the input is five, output is a = 1, b = 0, c = 1, d = 1, e = 0, f = 1and g = 1.

If the input is six, output is a = 1, b = 0, c = 1, d = 1, e = 1, f = 1and g = 1.

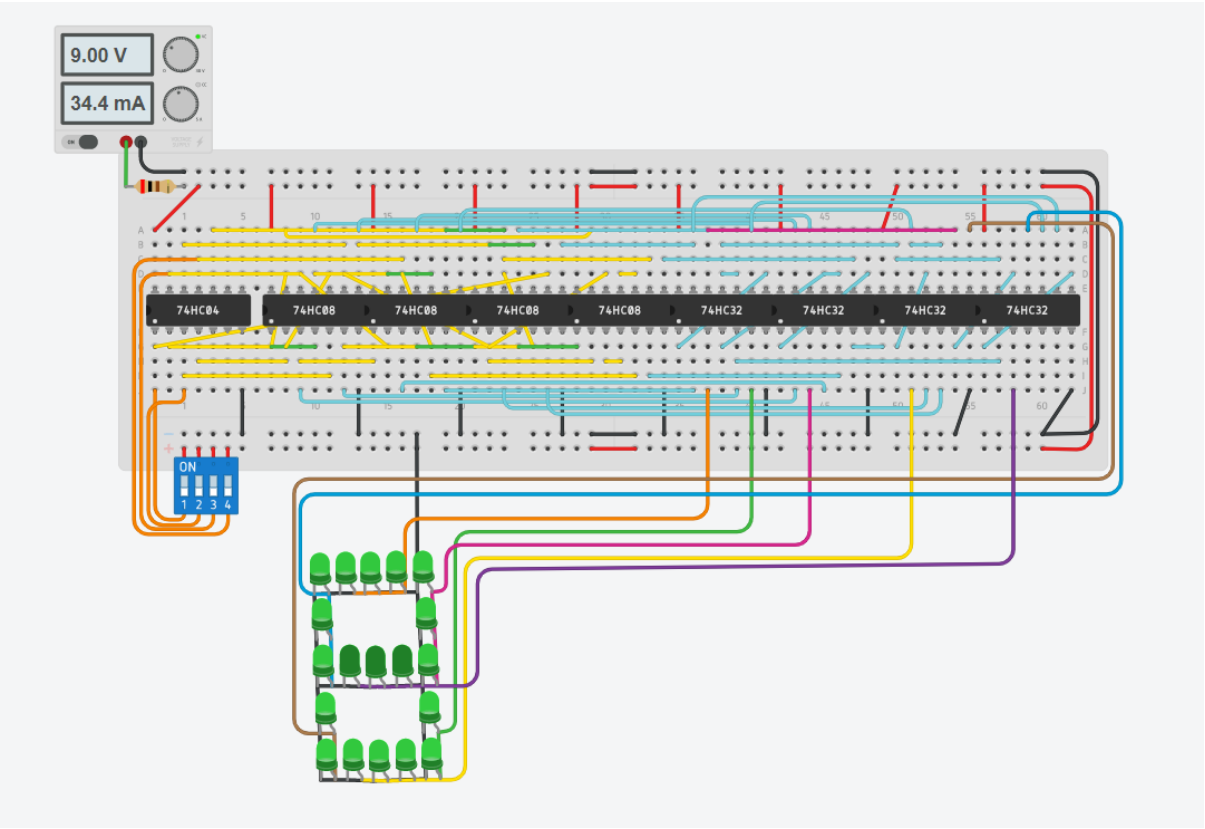
If the input is seven, output is a = 1, b = 1, c = 1, d = 0, e = 0, f = 0and g = 0.

If the input is eight, output is a = 1, b = 1, c = 1, d = 1, e = 1, f = 1 and g = 1.

If the input is nine, output is a = 1, b = 1, c = 1, d = 1, e = 0, f = 1 and g = 1.



Software


9.00 V
34.4 mA
74HC04
74HC08
74HC08
74HC08
74HC08
74HC32
74HC32
74HC32
74HC32
ON
1 2 3 4

## Applications of Seven Segment Displays:

Common applications of seven segment displays are in:

- Digital clocks
- Clock radios
- Calculators
- Wrist watches
- Speedometers
- Motor-vehicle odometers
- Radio frequency indicators

## CONCLUSION:

We have done this 7 segment display using gates and only LED'S arranged in 8 pattern. The device has vast use in most old and modern devices. Seven-segment displays are used to display the digits in calculators, clocks, various measuring instruments, digital watches and digital counters.

## REFERENECES:

digital design fourth edition m. morris mano