<div align="center">

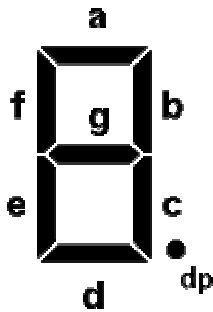**CAT – II**
Exercise-6: 7 Segment Display

</div>

- 7-Segment Display Layout and encoding (Look up table)
- AT89C51ED2 7 Segment Interface Diagram and description
- Selection of Digit using Ports
- 7 Segment code look up table
- Passing of 7 segment code for numerals or hex via Ports
- Hands On:
  - 4-bit counter (Decimal / Hex) (Up / Down)

Seven-Segment Display Layout

Numbers to 7-segment-code

A single byte can encode the full state of a 7-segment-display. The most popular bit encodings are *gfedcba* and *abcdefg* - both usually assume 0 is *off* and 1 is *on*.

This table gives the hexadecimal encodings for displaying the digits 0 to 9:

| Digit	gfedcba	abcdefg	a	b	c	d	e	f	g
0	0x3F	0x7E	on	on	on	on	on	on	off
1	0x06	0x30	off	on	on	off	off	off	off
2	0x5B	0x6D	on	on	off	on	on	off	on
3	0x4F	0x79	on	on	on	on	off	off	on
4	0x66	0x33	off	on	on	off	off	on	on
5	0x6D	0x5B	on	off	on	on	off	on	on
6	0x7D	0x5F	on	off	on	on	on	on	on
7	0x07	0x70	on	on	on	off	off	off	off
8	0x7F	0x7F	on	on	on	on	on	on	on
9	0x6F	0x7B	on	on	on	on	off	on	on

```
/*Lookup Table for displaying 0 to 9 digits
         array_dec[10]:->
 value= h g f e d c b a        On 7-SEG U15
 0x3F = 0 0 1 1 1 1 1 1   -> Displaying '0'
 0x06 = 0 0 0 0 0 1 1 0   -> Displaying '1'
 0x5B = 0 1 0 1 1 0 1 1   -> Displaying '2'
 0x4F = 0 1 0 0 1 1 1 1   -> Displaying '3'
 0x66 = 0 1 1 0 0 1 1 0   -> Displaying '4'
 0x6D = 0 1 1 0 1 1 0 1   -> Displaying '5'
 0x7D = 0 1 1 1 1 1 0 1   -> Displaying '6'
 0x07 = 0 0 0 0 0 1 1 1   -> Displaying '7'
 0x7F = 0 1 1 1 1 1 1 1   -> Displaying '8'
 0x6F = 0 1 1 0 1 1 1 1   -> Displaying '9' */
```

Six digit 7-segment display interface

Six Multiplexed 7- Segment Displays:

Interface Diagram:
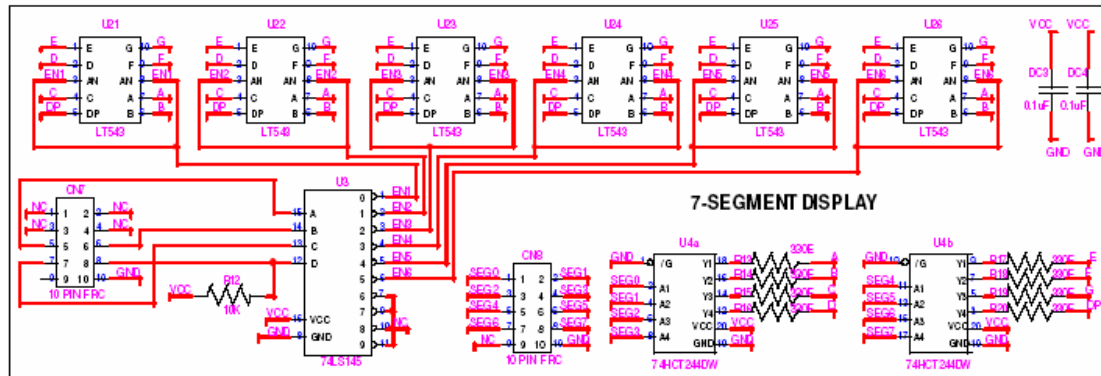
7 SEGMENT DISPLAY

There are six multiplexed 7-segment display units (U21, U22, U23, U24, U25 and U26) on the board.

Each display has 8-inputs SEG-A (Pin-7), SEG-B (Pin-6), SEG-C (Pin-4), SEG-D (Pin-2), SEG-E (Pin-1), SEG-F (Pin-9), SEG-G (Pin-10) and SEG-H (Pin-5) and the remaining pins pin-3 & pin-8 are Common Cathode CC.

These segments are common cathode type hence active high devices.

The port lines P0.4 to P0.7 are used to select one of the six digits as shown in the table below.

These signals P0.4 to P0.7 is used as inputs to the 74LS145 (U3) and the output lines of the decoder are used as enable lines for six 7-segment displays.

The port lines P1.0 to P1.7 are used as segment lines for the six digits through the 74HCT244 buffer (U4).

Selection Of seven segment displays:

P0.7	P0.6	P0.5	P0.4	Display unit selected
0	0	0	0	U21
0	0	0	1	U22
0	0	1	0	U23
0	0	1	1	U24
0	1	0	0	U25
0	1	0	1	U26