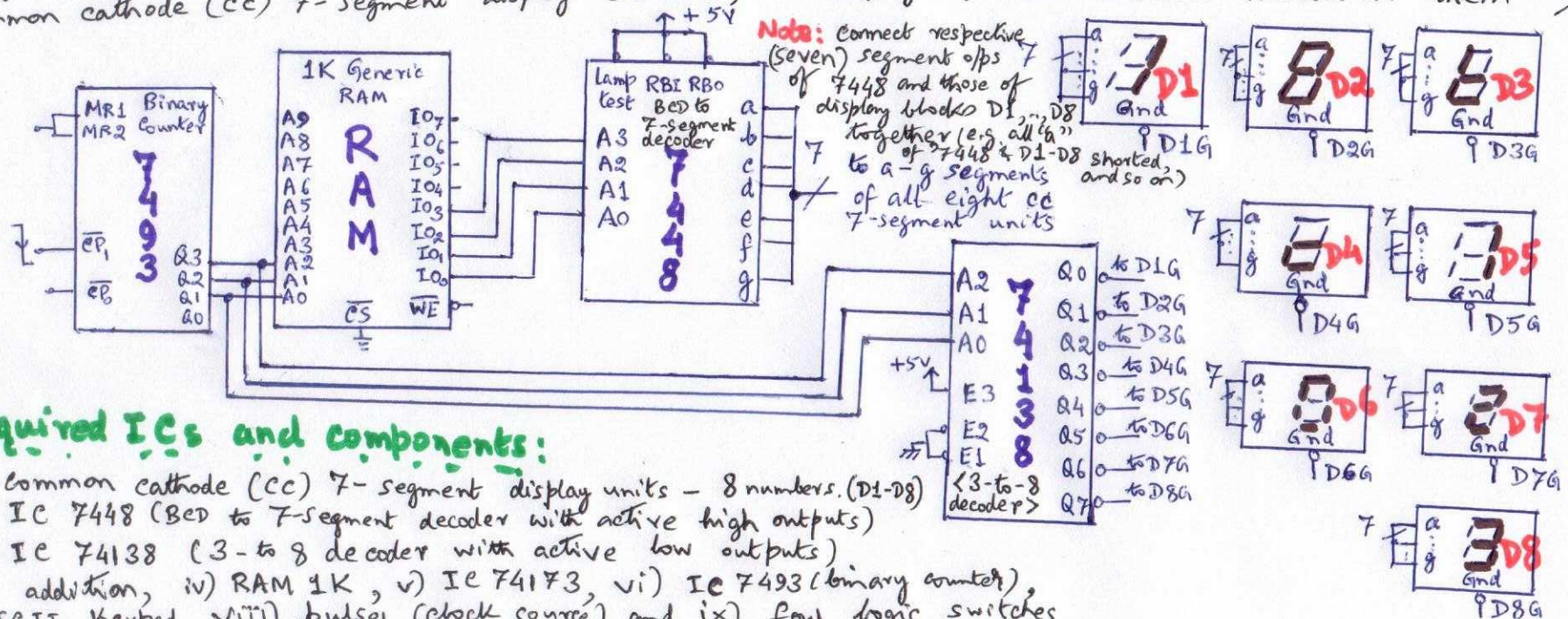


## Experiment on Implementing Multiplexed (Character-oriented) 7-segment LED display

< In previous experiment, I wrote my Roll number e.g. 18EC1023 (ignoring one zero) in the first 8 memory locations of RAM 1K and displayed the sequence 18EC1023 repeatedly on a single common anode (CA) 7-segment display element. In the present experiment, we shall use eight common cathode (CC) 7-segment display elements, and display 8-character roll number on them >



### Required ICs and components:

- Common cathode (CC) 7-segment display units - 8 numbers (D1-D8)
  - IC 7448 (BCD to 7-segment decoder with active high outputs)
  - IC 74138 (3-to-8 decoder with active low outputs)
- In addition, iv) RAM 1K, v) IC 74173, vi) IC 7493 (binary counter), vii) ASCII keypad viii) pulser (clock source) and ix) four logic switches related to the previous experiment will be needed.

**Major steps:** i) Write the eight characters of your roll number into the first eight locations of generic RAM 1K.

ii) With the above connection of digital ICs and components in place, and the binary counter clock input being fed with continuous clock pulses (from a pulser), the display can appear to remain steady (for higher clock frequency) or flicker unsteadily (for lower clock frequency). For this

**Simulation** → Digital Options → Simulation speed can be varied from 1 to 30.



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Note: as the counter state progresses from  $Q_3 Q_2 Q_1 = 000$  to  $Q_3 Q_2 Q_1 = 111$ , at any point of time, only one of the eight 7-segment units will be driven. When  $Q_3 Q_2 Q_1 = 000$  (for example), only  $Q_0$  o/p of IC 74138 will be at logic '0' so that only display unit **D1** will be glowing. Although the remaining seven units are not powered up at that time, if the clock speed is quite high, they will appear to be emitting light (owing to persistence of vision) at the same time.

i) IC 7448 - BCD to 7-segment decoder with active high outputs. This IC is intended to work with common cathode 7-segment display units. The control signals lamp test, RBI and BI/RBO can be kept at inactive (HIGH) level.

ii) IC 74138 - 3-to-8 decoder with active low outputs. This IC has two active low enable inputs  $\overline{E1}$  and  $\overline{E2}$  and one active high enable input  $E3$ . The (active low) outputs  $\overline{Q0}, \dots, \overline{Q7}$  of the decoder are connected to the ground pins of the eight 7-segment display blocks D1, ..., D8.

iii) The seven (segment) outputs a, b, c, d, e, f and g (of IC 7448) are connected to the respective segment pins of the display units D1, ..., D8. That is, the 'a' (segment) output of IC 7448 is connected to only 'a' pin of each of the eight display units D1, ..., D8. Likewise, the 'b' o/p of 7448 should be connected to only 'b' pin of each of the eight display blocks D1, ..., D8, and so on.