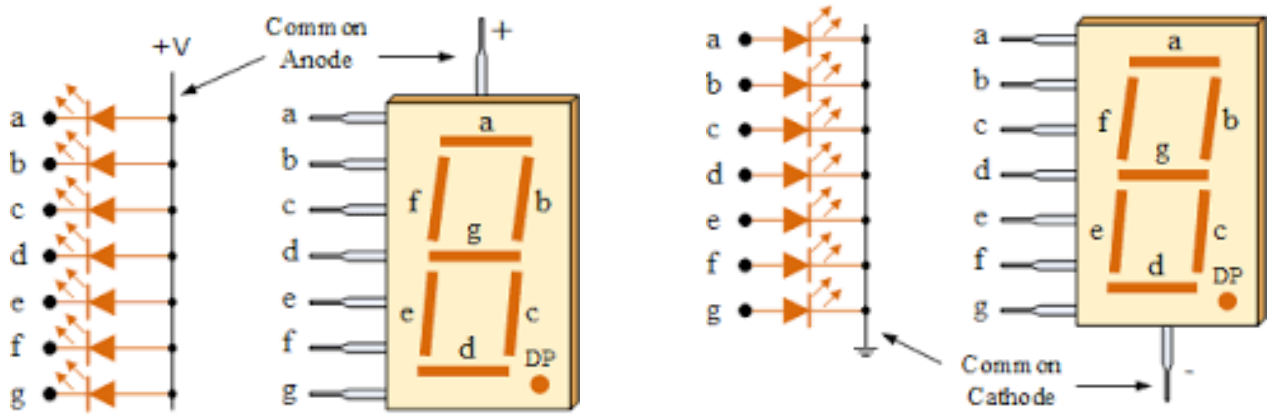
Homework 7

Due at the beginning of your scheduled lab period

1. [8 pts] The 7-segment *common anode* LED display provided in your DK-2 kit is a MAN72; its *common cathode* "cousin" is the MAN74. The datasheets for these devices are available on the References page of the course website. Document the difference between *common anode* and *common cathode* 7-segment LED displays by drawing a diagram (showing how the LEDs are connected) in each configuration.



2. [4 pts] For the *common anode* case (MAN72, used in lab), calculate the value of the current limiting resistor that should be used (for each segment) to obtain *maximum brightness* in a *current sinking* configuration with an ATF22V10C. Use Figure 1 (*Forward Current vs. Forward Voltage*) on the MAN72/74 datasheet to *estimate* the forward voltage of each LED segment based on the maximum amount of current that can be ***sunk*** by an ATF22V10C output pin at V_{OL} *max* (see ATF22V10C datasheet available on References page of the course website).

   V_{OL} = 0.5 V @ 16 mA

   est. V_F @ 16 mA = 2.1 V (eyeball)

   R = (5 – 2.1 – 0.5)/0.016 = 150 Ω

3. [4 pts] For the *common cathode* case (MAN74, ***not*** used in lab), calculate the value of the current limiting resistor that should be used (for each segment) to obtain *maximum brightness* in a *current sourcing* configuration with an ATF22V10C. Use Figure 1 (*Forward Current vs. Forward Voltage*) on the MAN72/74 datasheet to *estimate* the forward voltage of each LED segment based on the maximum amount of current that can be ***sourced*** by an ATF22V10C output pin at V_{OH} *min* (see ATF22V10C datasheet available on References page of the course website).

   V_{OH} = 2.4 V @ 4 mA

   est. V_F @ 4 mA = 1.8 V (eyeball)

   R = (2.4 – 1.8)/0.004 = 150 Ω

4. [4 pts] Based on Figure 2 of the MAN 72/74 datasheet, estimate the ***ratio*** of *relative luminous intensity* for the common anode configuration vs. the common cathode configuration. If the design objective is *maximum brightness*, which configuration is preferable?

   est. 1.8/0.4 = 4.5 (eyeball)
   → common anode configuration would be preferable in this case