

# ECE 320 - Homework #8

Boolean Logic, DTL, TTL Logic. Due Monday, October 21st

## Transistor Data Sheets

1) Find the data sheets for a 3904 transistor. From the data sheets, determine

- $V_{be}$  @ 20mA
- $V_{ce(sat)}$
- $h_{FE} = \beta$
- $I_{c(max)}$

## Boolean Logic

2) Design a circuit using NAND gates to implement  $Y(A,B,C,D)$  (i.e. circle the 1's)

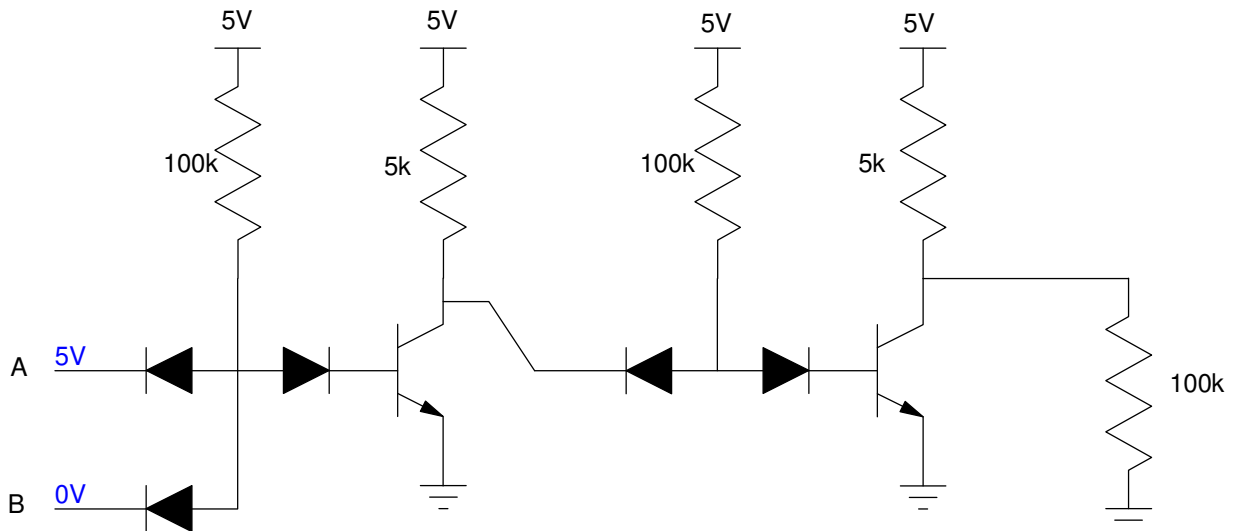
3) Design a circuit using NOR gates to implement  $Y(A,B,C,D)$  (i.e. circle the 0's)

Y(A,B,C,D)		CD			
		00	01	11	10
AB	00	1	0	1	0
	01	0	0	0	1
	11	x	x	x	x
	10	0	1	x	x

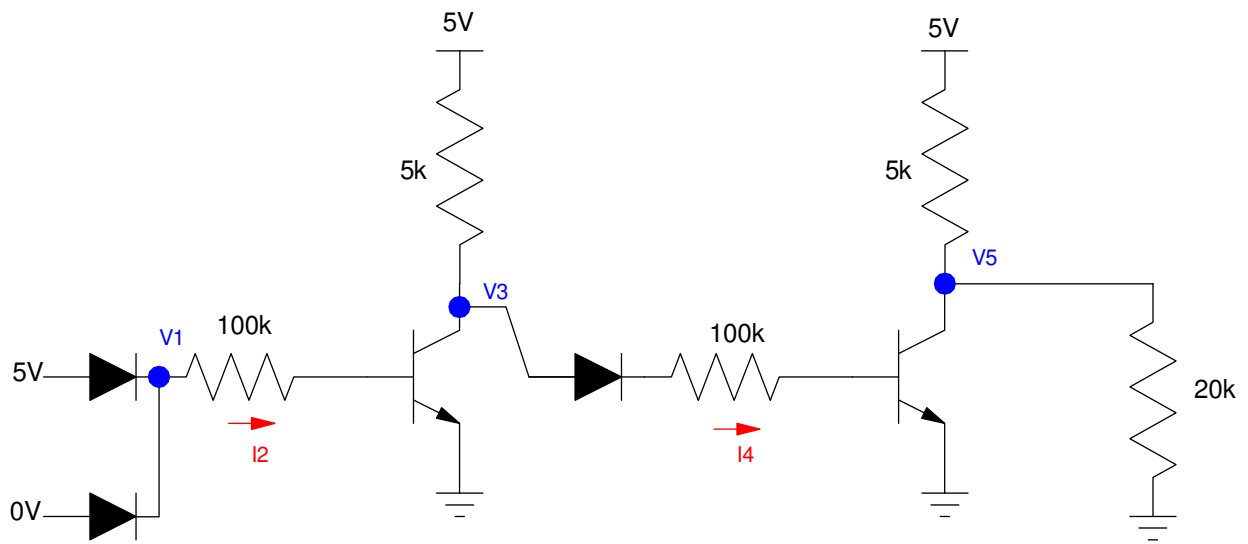
Problem 2 & 3:  $Y = f(A, B, C, D)$

## DTL Logic

4) Determine the voltages and currents for the following DTL AND gate. Assume 3904 transistors (from problem #1)



5) Determine the voltages and currents for the following DTL OR gate. Assume 3904 transistors



6) Check your analysis for problem #5 (DTL OR) in PartSim (or similar program)

7) (Lab): Build a DTL OR gate in lab. Measure

- The voltages when the input is { 0V, 0V },
- The voltages when the input is { 0V, 5V }, and
- The maximum frequency the logic gate can respond to (apply a square wave at the input)

## TTL Logic

8) Determine the voltages for the following TTL inverter. Assume 2n222 transistors.

