

# ANSWERS TO

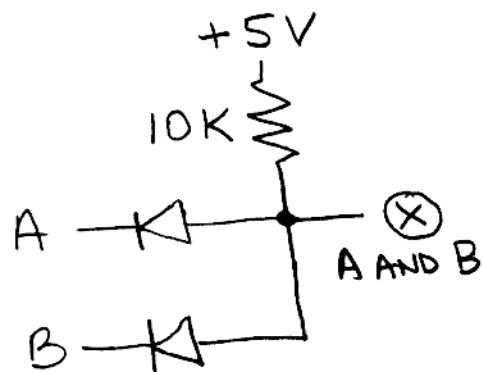
## BioE 1310 - Homework 7

① The primary of a transformer sees 120 VAC  $R_{ms}$  and has 300 turns of wire. The secondary has 50 turns. What is the peak AC voltage across the secondary? 28.3V  
answer

② The "truth table" and diode circuit for an AND gate are shown below.

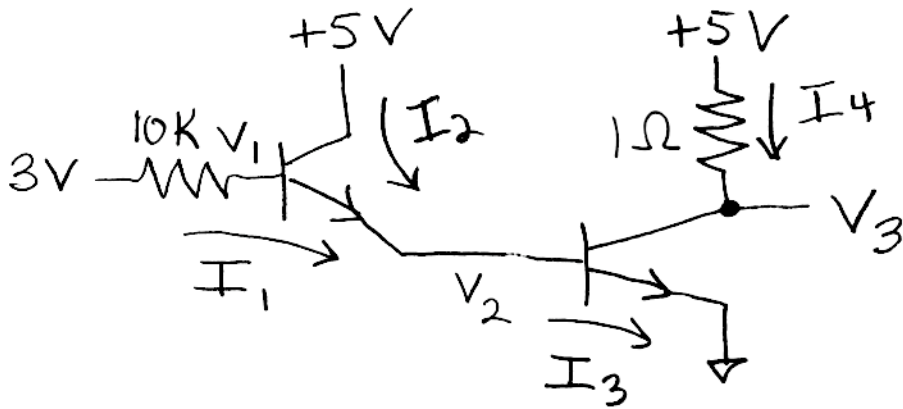
A	B	A AND B	VOLTAGE AT ⊗
0	0	0	0.5V
0	1	0	0.5V
1	0	0	0.5V
1	1	1	5.0V

} Fill in answers



Assuming "1" means +5V and "0" means 0V, and assuming a 0.5V forward bias voltage drop across the diodes, fill in the voltage you would see at ⊗ for all four states

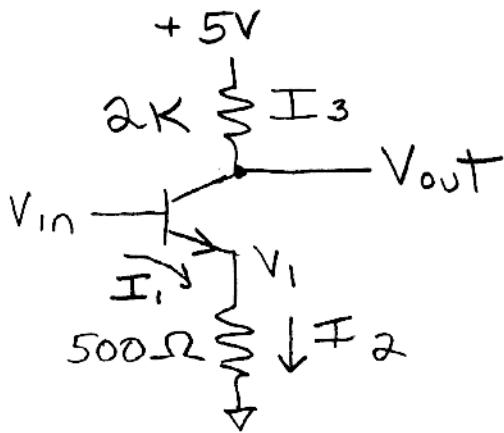
③ assuming a 0.5V forward bias voltage drop across B-E junctions, and  $\beta = 100$ , solve for the indicated voltages and currents



- $V_2$  0.5V
- $V_1$  1.0V
- $I_1$  0.2mA
- $I_2$  20mA
- $I_3$  20mA
- $I_4$  2A
- $V_3$  3V

④ Do the same as in ③ for this circuit when  $V_{in} = 1.0V$  & when  $V_{in} = 1.1V$ .

What is the AC gain,  $\frac{\Delta V_{out}}{\Delta V_{in}}$ ? -4 ← AC gain



- |                     |                       |
|---------------------|-----------------------|
| $V_{in} = 1.0V$     | $V_{in} = 1.1V$       |
| $V_1$ <u>0.5V</u>   | $V_1$ <u>0.6V</u>     |
| $I_2$ <u>1mA</u>    | $I_2$ <u>1.2mA</u>    |
| $I_1$ <u>10μA</u>   | $I_1$ <u>12μA</u>     |
| $I_3$ <u>1mA</u>    | $I_3$ <u>1.2mA</u>    |
| $V_{out}$ <u>3V</u> | $V_{out}$ <u>2.6V</u> |