Homework Notes

HW1

Pr. 9 – just consider the Wheatstone

HW2

Pr. 6 - (try sketching V_{out} vs. t for square-wave V_{in} before designing RC)

HW3

Pr. 7 - phase angel -30°

Pr. 8 - plot either v_{out}/v_{in} or $\ln(v_{out}/v_{in})$ vs. $\ln(f)$

HW4

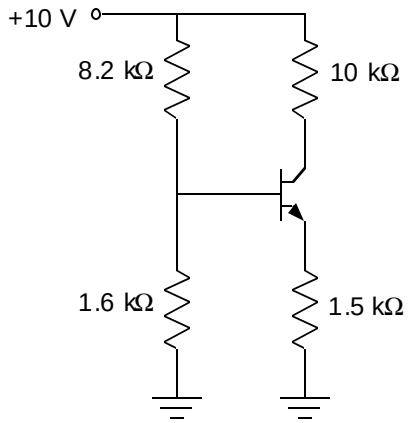
"A" Note: Assume all voltages are rms values, unless told otherwise.

Suppose a 6-V (rms) transformer (with 120 V, 60-Hz input) followed by a half-wave rectifier provides current to a 1-kΩ resistor. (THIS IS NOT AN OPTIONAL PROBLEM!)

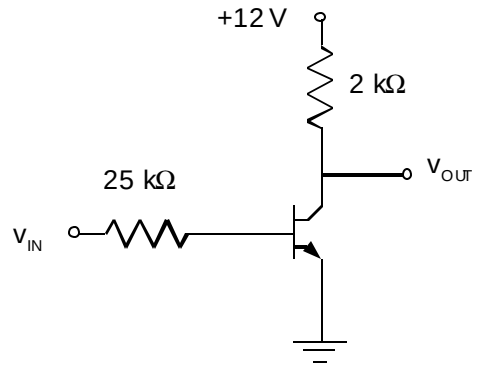
(a) What are the peak voltage across and peak current through the resistor? (Be sure to take into account the voltage drops across the diodes.)
(b) What is the smallest filter capacitor that will insure that the voltage doesn't drop below 7 V? Give your answer in units of μF. (You may assume that the current remains very close to its peak value.)
(c) What is the ripple factor?

HW5

1. What is the approximate current in the 10-kΩ resistor in the circuit below? (Hint: Very little current goes into the base of the transistor.)

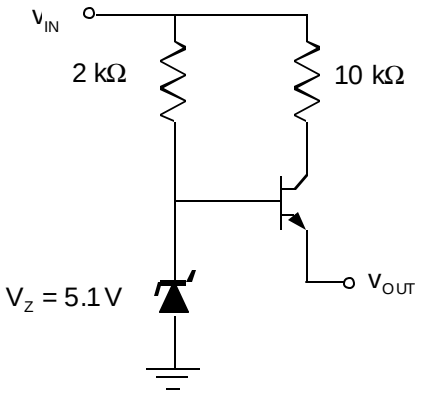


2. For the circuit below, suppose β = 50 for the transistor and the input voltage (v_{IN}) is +2.5V?



(a) What is the base current?
(b) What is the collector current?
(c) What is the output voltage (v_{OUT})?

3. For the circuit below, what is output voltage (v_{OUT}) if the input voltage (v_{IN}) fluctuates between 8 and 10 Volts?



Selected Answers:

1. $i_C \approx 0.69$ mA
2. $i_B = 76\ m\text{A}$, $i_C = 3.8\ m\text{A}$, $v_{out} = 4.4\ V$

HW6

Pr. 3 - V_{out} in terms of V_{in}

Pr. 4 - V_{out} and input impedance

HW7

Pr. 2 - You're free to choose the value of one of the 3 unknown components; given that, you can determine the necessary values for the other two components.

HW8

Pr. 9 - It may be useful to first figure out an inverter, i.e., a NOT gate.

HW9

"A" An 8-bit, successive-approximation ADC has an input range of 0 to 5 V and has a clock frequency of 1-kHz.

(a) What increment in the input will cause a 1-digit change in the output?
(b) What range of voltages corresponds to the output of 00001101?
(c) How long does it take the ADC to make the conversion?
(d) If the input is a sine wave, what is the maximum frequency that it can have and still be adequately sampled?

Pr. 13 - The audible range is roughly 20Hz – 20 kHz

Pr. 17 - Also calculate for 0.5 V input