HW3

Due 7/6/2024 at 17.00

Instructions for Homework: DO NOT LEAVE YOUR ANSWER AS A FRACTION (E.g. 13/2 IS NOT OK, BUT 6.5 IS OK!)

1) Solve the following problems by hand on an A4 size paper, clearly explain your results. Draw a box for the numeric value you found for the answer. It is your responsibility to show a clearly written and step by step solutions for the homework questions. If the TA cannot read your answer, you will NOT get any point for that question. *It is your responsibility to check your answers multiple times before submitting the homework.*

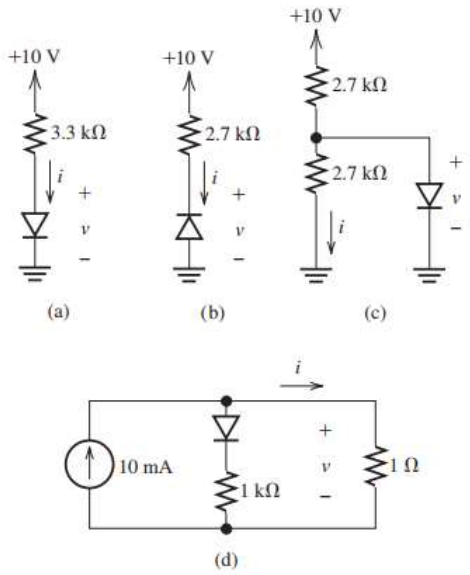
2) Scan your answers into PDF with a file name as "StudentName_LastName_StudentID.pdf". It is your responsibility to make sure the scanned documents readibility is clear. You will not get any points for blurry or low quality answers

3) Upload your answer into **Esuzem HW3 section before the deadline.** If you reach the max file size for Esuzem, upload a document with an active google drive link as a PDF and public access. If the TA cannot download your PDF, you will get a zero point for the homework.

Submit your solutions for the questions below from our text book (7th Ed Allan Hambley, Electrical Engineering Principles)

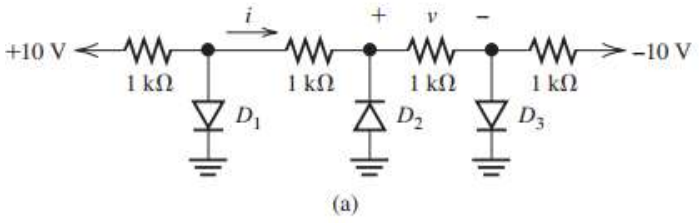
Q1)

P9.36. Find the values of I and V for the circuits of Figure P9.36, assuming that the diodes are ideal.

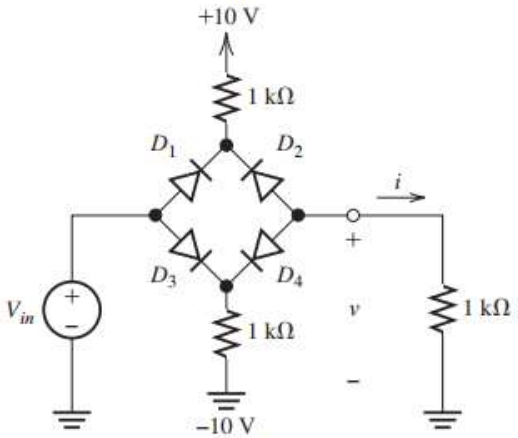


Q2)

P9.38. Find the values of I and V for the circuits of Figure P9.38, assuming that the diodes are ideal. For part (b), consider $V_{in} = 0, 2, 6$, and 10 V. Also, for part (b) of the figure, plot V versus V_{in} for V_{in} ranging from −10 V to 10 V.



(a)



(b)

Q3)

T9.2. The diode shown in Figure T9.2 is ideal. Determine the state of the diode and the values of v_x and i_x.

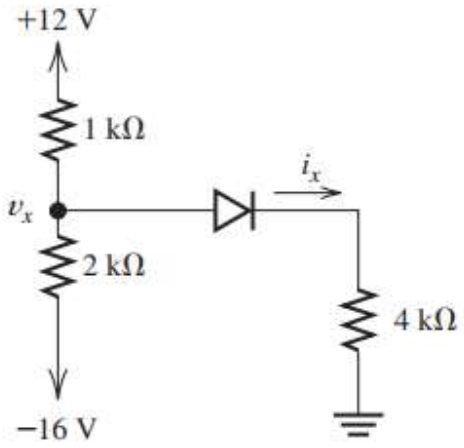


Figure T9.2

Q4)

P11.31. **a.** Find the value of I_{DQ} for the circuit shown in Figure P11.31. Assume that $V_{to} = 4$ V and $K = 1$ mA/V^2. **b.** Repeat for $V_{to} = 2$ V and $K = 2$ mA/V^2.

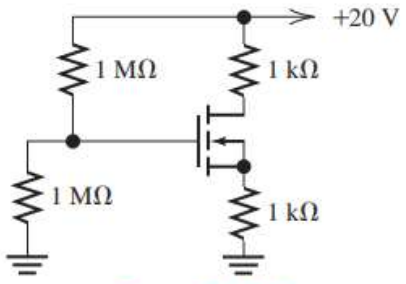


Figure P11.31

Q5)

P11.52. Consider the amplifier shown in Figure P11.52.

a. Draw the small-signal equivalent circuit, assuming that the capacitors are short circuits for the signal.

b. Assume that $r_d = \infty$, and derive expressions for the voltage gain, input resistance, and output resistance.

c. Find I_{DQ} if $R = 100\ \text{k}\Omega$, $R_f = 100\ \text{k}\Omega$, $R_D = 3\ \text{k}\Omega$, $R_L = 10\ \text{k}\Omega$, $V_{DD} = 20\ \text{V}$, $V_{to} = 5\ \text{V}$, and $K = 1\ \text{mA/V}^2$. Determine the value of g_m at the Q point.

d. Evaluate the expressions found in part (b) by using the values given in part (c).

e. Find $v_o(t)$ if $v(t) = 0.2\sin(2000\pi t)$.

f. Is this amplifier inverting or noninverting?

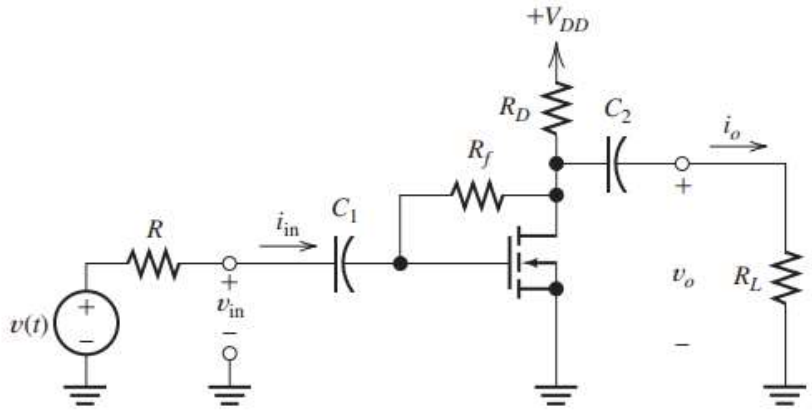


Figure P11.52

Q6)

P11.13. Find the currents and the region of operation for each of the enhancement transistors shown in Figure P11.13 for $V_{in} = 0$ and for $V_{in} = 5$ V. The transistors have $|V_{to}| = 1$ V and $K = 0.2$ mA/V^2.

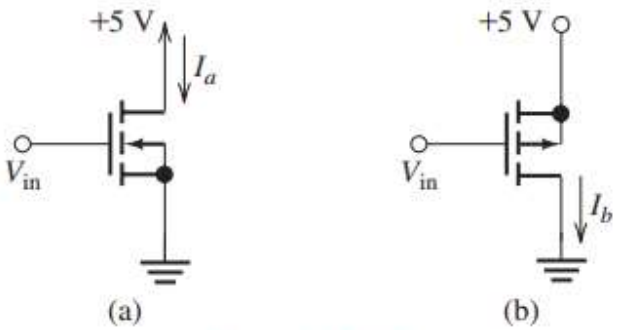


Figure P11.13