UNIVERSITY OF CALIFORNIA
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EEECS100/42, Fall 2009 **T. K. Gustafson**

NAME(PLEASE PRINT CLEARLY):
S.I.D. :
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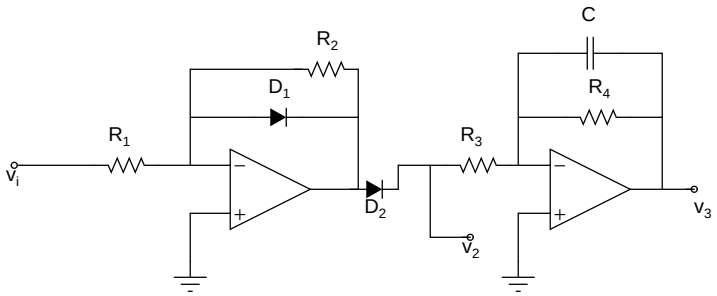
Due : Nov 13 at lecture

Problem Set No. 5

Based upon Chapters 3-5 of Hambley, Basic MOSFET (12.1,12.2), Diode (10.4-10.7) ,and Transistor (13.1-13.4) and digital concepts. Three problems are basically review

Problem Number one) Transient and Steady State RLC Circuit (Review)
a) Hambley 4.22 .
b) Also, what are the initial currents just after the switch is closed.
c) Also solve for the steady-state current i_1 if the source voltage is $100cos(\omega t)$ for $\omega = 100$ rad/sec.
d) Use LTSpice to plot i_3 as a function of ω for $1 < \omega < 10000$

Problem Number two) Voltmeter (Op Amps and Ideal Diodes) (Review)
The following circuit is a basic a.c. voltmeter.



Treat the diodes as ideal.
If the input is a sinusoid having a peak amplitude V_p, sketch the voltage waveform v_2 (Hint it is a rectified sine or cosine). Calculate the average value of v_2 in terms of R_1, R_2 and V_p. Obtain an expression for the dc output voltage v_3 in terms of V_p and the resistors R_1 to R_4. Assume R_4C is much greater than the period of the sinusoid so that only the average value of v_2 is not grounded by the capacitor.

If you wish to simulate this circuit, you can use $1k$ resistors, the generic diode, and LT1001A Op Amps with 12 volt plus and minus bias voltages. A 50 μF capacitor is sufficient. Increasing it shows the effect even more. Do a transient analysis for a sinusoid input at 60 Hz for 24 periods. Carry out the analysis from 0 to 400 ms. This should verify the analytical result.

Problem No 3) Load Line Analysis and bipolar characteristics
a) Hambley 12.20 . I believe you only have to concern yourself with the saturation region of the FET.
b) Hambley 13.29
c) Hambley 13.19

Problem No 4) Binary -decimal representation, Boolean concepts
a) Hambley 7.8 (Do this on a calculator if you wish!)
b) Hambley 7.27
c) Hambley 7.46 (Should also look at 7.47)

Problem No 5) Karnaugh Maps, SOP and POS
Hambley Problem 7.54

Problem No 6) Ideal Op-Amp Review
Hambley Problem 14.25

Problem No 7) Multi frequency component signal
Hambley Problem 6.24