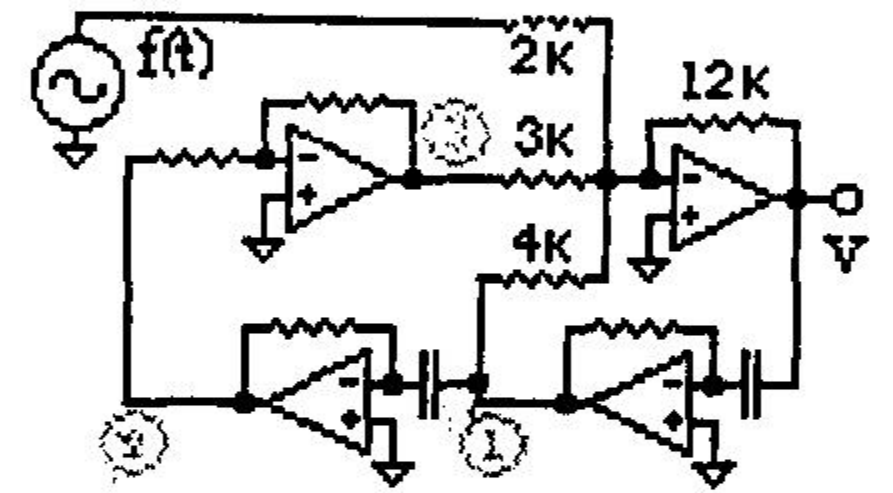


PHY 218  
FINAL

1. Assume that all unmarked resistors in the Analogue computation circuit shown are equal, and that  $\tau = 1$ . Take  $f(t) = 5\cos 2t$ .

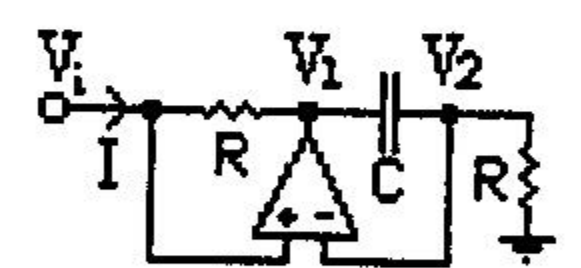
- a. Write down the voltages at the nodes 1, 2, and 3 (6 pts.)
- b. Write down the differential equation for (v). (6 pts.)



2. a. Write down the equations to calculate  $V_1$  &  $V_2$  (6 pts.)

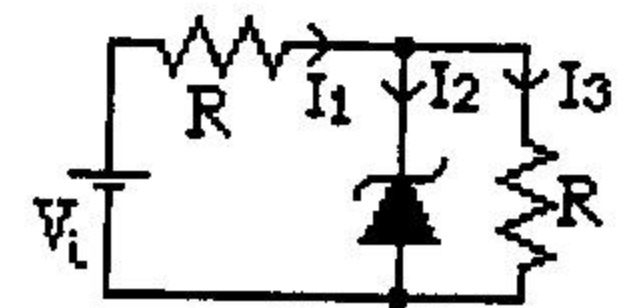
b. Show that  $V_i = (-j\omega CR^2)I$  (4 pts.)

c. We may write  $V_i = ZI$  where  $Z = (-j\omega CR^2)$  (2 pts.)  
What kind of "azif" component is Z?



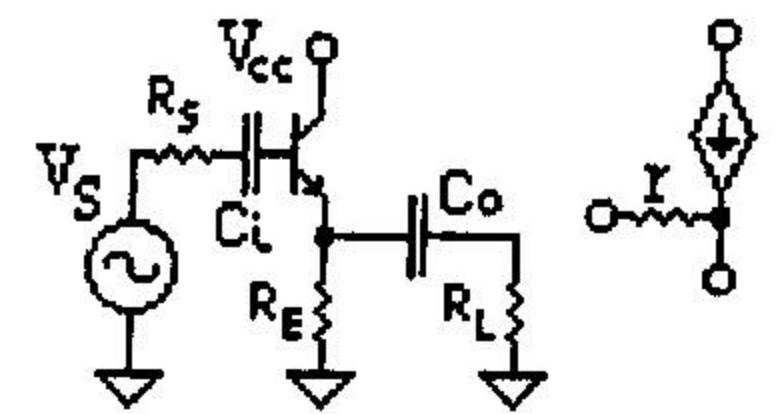
3. Take  $V_z = 6v$ ,  $R = 100\Omega$ ,  $V_{in} = 18v$ , and  $r_z = 0$  (ideal Zener). Calculate

- a. The 3 currents (6 pts.)
- b. The power given by the source and that dissipated in the Diode. (6 pts.)



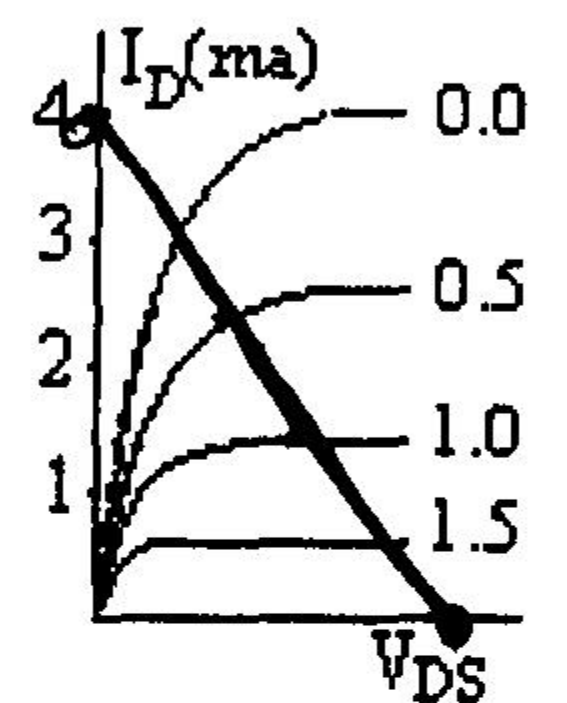
4. a. Draw the a.c. equivalent of the circuit shown using the transistor model given. (9 pts.)

b. Identify the circuit (say, e.g. It's a Feedback Oscillator) (3 pts.)



5. The table gives the values of  $I_{DS}$  as a function of  $V_{GS}$ . (7 pts.)  
Draw the appropriate graph and show that the pinch off voltage is 2.5 v

$I_D$ (ma)	0.0	0.5	1.0	1.5
$V_{GS}$ (volt)	4.00	2.56	1.44	0.64
$I_D/V_{GS} = V_{DS}(V)$	0	<del>1.954</del> 0.195	<del>0.694</del> 0.694	<del>2.34</del> 2.34



6. Answer 9 of the following 12 questions briefly. The 10<sup>th</sup> answer will be ignored. (9x5 = 45 pts.)

a. What are the roles of  $C_i$  and  $C_o$  in Question 4?

b. What is meant by Gain x BandWidth = constant? Explain by the use of a diagram.

c. Why should the impedance of a cable match that of a receiver?

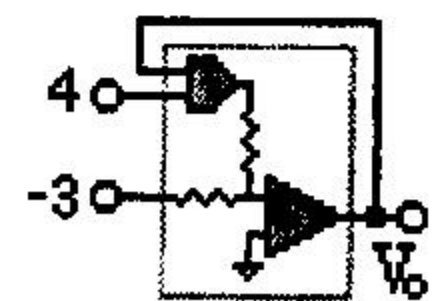
d. Draw the block diagram of a feedback RC oscillator.

e. What is the function of a *Shmidt* trigger (drawing the circuit not obligatory)



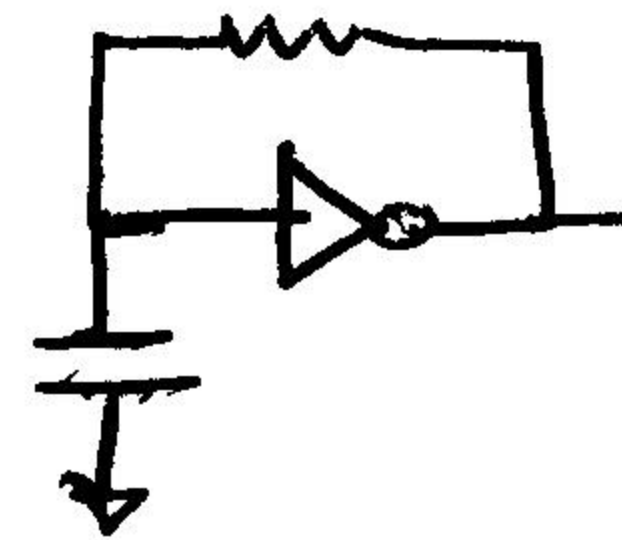
f. Identify the figure shown. Argue that  $I_{DS} = 0$

g. Why are the widths of the depletion zones on either side of a p-n junction in general UNEqual?



h. Take  $V_{cc} = 12$  and show that  $V_o = 9$

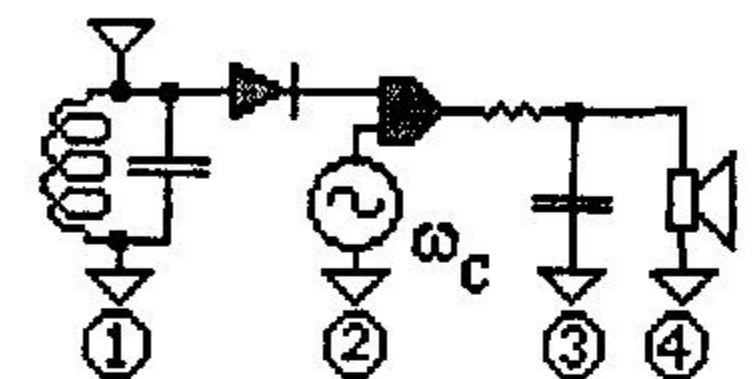
i. Identify the circuit opposite (e.g. say it is an Inverter)



1. Define Magnetic Flux Linkage in a transformer

2. Name 3 demonstrations performed during lectures.

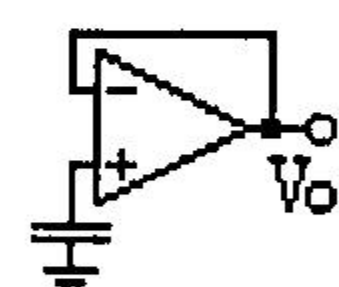
3. Identify the 4 stages in the figure opposite



Good Luck!

$$4 \times 12 + 7 + 45 = 100$$

Bonus 1: Assume that the opamp is not ideal. What will the output of the circuit be?



Bonus 2: Draw a circuit to compute  $V^{1.23}$