PROBLEM 1

Assume that we have approximated the I-V characteristic of a nonlinear device by straight line segments shown in figure (a).

A. Find the equivalent circuit for each line segment (using resistors and batteries).

B. The element is now inserted in the circuit shown in Fig. (b). Find the operating point (I-V of the device) and power delivered to the device.
PROBLEM 3
Using any components you wish, design TWO circuits that exhibit the following transfer characteristics respectively: If you use diodes assume constant voltage drop model with $V_D = 0.7$ V.
PROBLEM 4

PART A. The input signal for each of the circuits below is a sinusoidal. Carefully plot the output voltage for each of the following circuits.

PART B. NEXT PAGE
PART B. The input signal in the following signals is sinusoidal as depicted. Match each circuit with its appropriate output.

(a) 

(b) 

(c) 

(d)
The full-wave bridge rectifier shown below is used to drive a nonlinear load which draws a constant current of 25 mA. For each diode, $V_T = 0.7$ V. The sinusoidal source $V_S$ has a peak value of 45.4 V and a frequency of 60 Hz.

\[ V_S = V_0 \sin \omega t \]

a) What is the peak value of $V_L$?
b) What is the frequency of the ripple component of $V_L$?
c) Estimate the peak-to-peak value of the ripple component of $V_L$.
d) What is the average (dc) value of $V_L$?
e) What is the time-average power dissipated in the load?
PROBLEM 6

Consider the voltage regulator circuit illustrated in Figure. The ac ripple voltage is 1 V peak to peak. The dc load voltage is 5 V. What is the Q-point current in the Zener diode? What is the maximum dynamic resistance allowed for the Zener diode if the output ripple is to be less than 10 mV peak to peak?