Fill out information below and attach this cover sheet to the FRONT of your HW.
If you do not (or enter incorrect information) you WILL loose 10 points on the HW.

NAME:_____
SID #:_____
Circle One: EE42 / EE100
If EE100, Lab Day:_____**,Time:**_____

L. Chua

EE 100

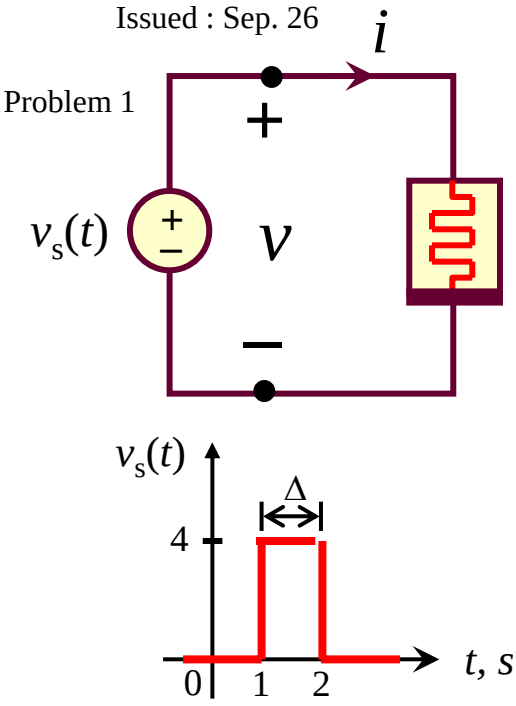
Fall 2008

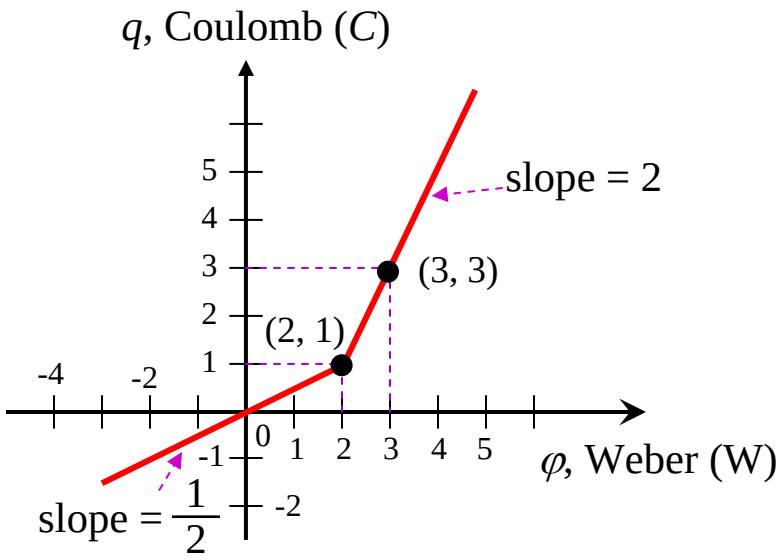
Issued : Sep. 26

Homework # 5

Due : Oct. 3

Problem 1





Constitutive relation :
$q = q(\varphi)$, $\varphi = \varphi(q)$

For the memristor circuit shown above, calculate and sketch :

(a) flux $\varphi(t) \triangleq \int_{-\infty}^{t} v(\tau)d\tau$, *for* $t \geq 0$

(b) charge $q(t) \triangleq \int_{-\infty}^{t} i(\tau)d\tau$, *for* $t \geq 0$

(c) memductance $W(\varphi) \triangleq \dfrac{dq(\varphi)}{d\varphi}$, $-4 \leq \varphi \leq 5$

(d) memristance $M(q) \triangleq \dfrac{d\varphi(q)}{dq} = \dfrac{1}{W(\varphi(q))}$, $-2 \leq q \leq 5$

(e) current $i(t) = \dfrac{dq(t)}{dt}$, *for* $t \geq 0$

Problem 2

Suppose that the nonlinear resistor $\mathcal{R}$ has a characteristic specified by the equation

$$v = 20i + i^2 + \tfrac{1}{2}i^3$$

(*a*) Express v as a sum of sinusoids, given

$$i(t) = \cos \omega_1 t + 2 \cos \omega_2 t$$

(*b*) If $\omega_2 = 2\omega_1$, what frequencies are present in v?

Problem 3

Use graphic series and parallel addition to derive the driving-point characteristics of the one-ports shown in Fig. P2. 22

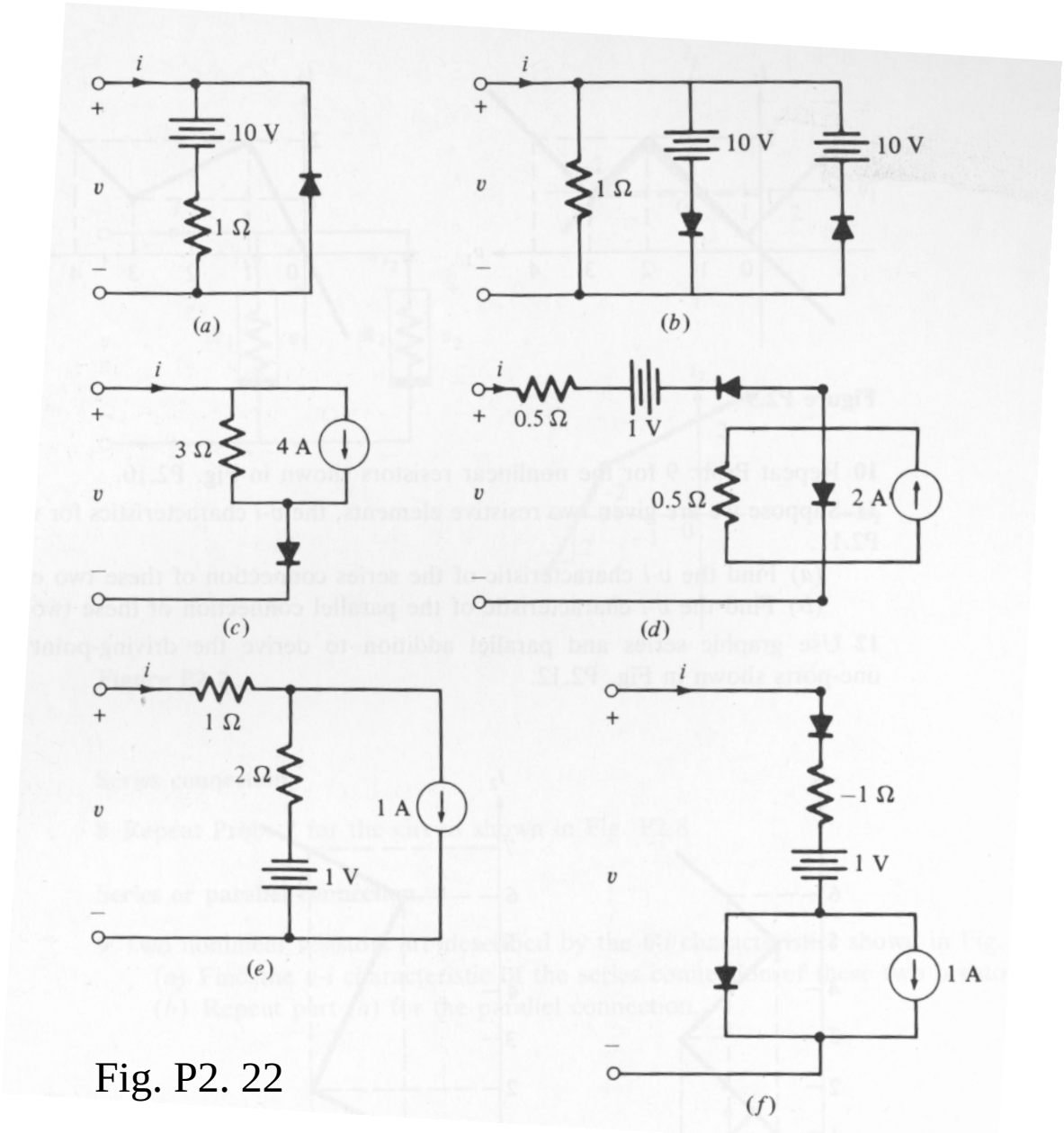


Fig. P2. 22

Problem 4

Use graphic series and parallel addition to find the driving-point characteristics of the circuits show in Fig. P2. 18.

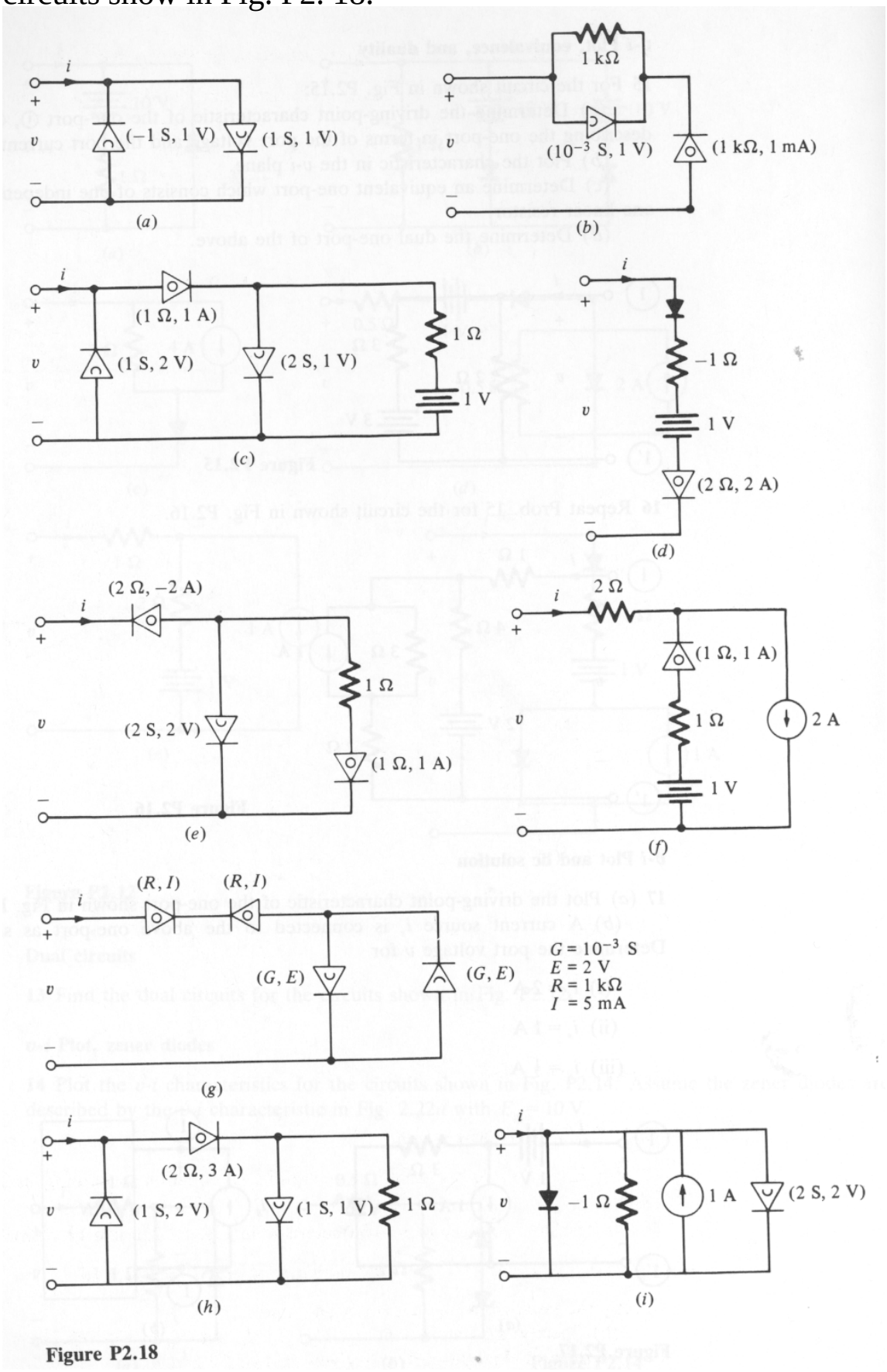


Figure P2.18