

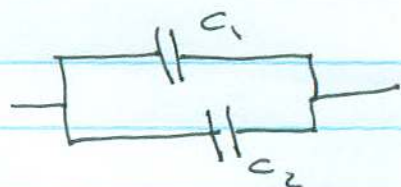
4-4

a) Parallel: $V_1 = V_2 = V$

$$Q = Q_1 + Q_2$$

$$= C_1 V + C_2 V = (C_1 + C_2) V = C V$$

$$C = C_1 + C_2$$

b) Series: $Q_1 = Q_2 = Q$

$$V = V_1 + V_2$$

$$= \frac{Q}{C_1} + \frac{Q}{C_2} = \frac{Q}{C}$$

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$



4-5

$$a) u_E = \epsilon_0 E^2 / 2$$

$$= \frac{Q^2}{2 \epsilon_0 A^2}$$

$$U = u_E \underbrace{A d}_{\text{volume}} = \frac{Q^2 d}{2 \epsilon_0 A}$$

$$\text{Using } C = \epsilon_0 A / d, \quad U = \frac{Q^2}{2C} = \frac{1}{2} QV = \frac{1}{2} CV^2$$

$$b) dU = V dq; \quad V = \frac{q}{C}$$

$$U = \int_0^Q V dq = \int_0^Q \frac{q}{C} dq = \frac{Q^2}{2C}$$