

Key Concepts for EE 452 Midterm

- Use correct units in all problems [V, A, W, J, s]
- Names of power semiconductor devices & their defining characteristics
- Ripple equations:

$$V_L \approx L \frac{\Delta i_L}{\Delta t}, \quad i_c \approx C \frac{\Delta V_C}{\Delta t} \quad \leftarrow \text{Evaluate in one ckt configuration.}$$

- Volt-second & Charge balance equations:

$$\langle V_L \rangle = 0 = D(V_L \text{ for configuration ①}) + D'(V_L \text{ for configuration ②})$$

$$\langle i_c \rangle = 0 = D(i_c \text{ for configuration ①}) + D'(i_c \text{ for configuration ②})$$

- Using balance equations, know how to obtain the following:

Know how to compute with loss mechanisms included (R_{on}, R_L, V_f)

- Voltage conversion ratio $M = \frac{V}{V_g}$
- Efficiency $\eta = \frac{P_{out}}{P_{in}}$
- Steady state inductor currents & cap voltages

↳ Apply to pick suitable devices

- Given device waveforms, compute switching energy & power loss



$$E_{loss} = \int_{T=t_0}^{T=t_{final}} v_{sw}(T) i_{sw}(T) dT$$

area under curve

$$P_{loss}^{sw} = F_{sw} E_{loss}$$

→ Know how η is impacted by P_{loss}^{sw} & F_{sw} .