

EE-365 - W1

PROBLEMS: 1 - 2

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PROBLEM NO.1

Calculate average and RMS values of the following signals:

- ▶ a) $s(t) = A \cdot |\sin(\omega t)|$
- ▶ b) $s(t) = A \cdot \sin^2(\omega t)$
- ▶ c) Bipolar square wave with uneven HIGH and LOW duration
- ▶ d) Unipolar square wave with uneven HIGH and LOW duration
- ▶ e) Modified square wave

Solutions:

- ▶ a) $S_{avg} = \frac{2}{\pi} \cdot A; S = \frac{\sqrt{2}}{2} \cdot A$
- ▶ b) $S_{avg} = \frac{A}{2}; S = \frac{A\sqrt{6}}{4}$
- ▶ c) $S_{avg} = A \cdot \frac{2t_H - T}{T}; S = A$
- ▶ d) $S_{avg} = A \cdot \frac{t_H}{T}; S = A\sqrt{\frac{t_H}{T}}$
- ▶ e) $S_{avg} = 0; S = A\sqrt{\frac{T-2t_0}{T}}$

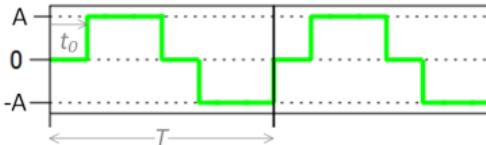
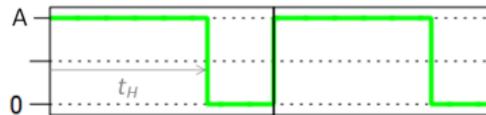
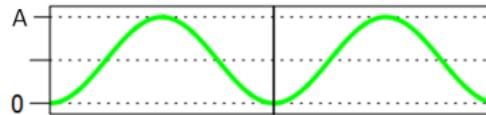
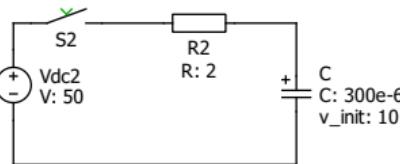
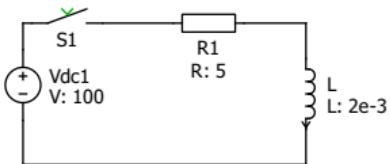


Figure 1 Waveforms

PROBLEM NO.2

Figures show simple R-L and R-C circuits with their respective parameters. Switches S_1 and S_2 are closed at $t=0$.



Calculate following:

- ▶ a) Steady state current of the inductor L and steady state voltage of the capacitor C
- ▶ b) Analytical expressions for the inductor current and voltage
- ▶ c) Analytical expressions for the capacitor current and voltage
- ▶ d) Sketch the waveforms from b) and c)

Solutions:

- ▶ a) $I_L = 20A, U_C = 50V$
- ▶ b) $i_L(t) = \frac{V_{DC1}}{R_1} (1 - e^{-\frac{t}{\tau}}); u_L(t) = V_{DC1} \cdot e^{-\frac{t}{\tau}}$ where $\tau = \frac{L}{R_1}$
- ▶ c) $i_C(t) = \frac{V_{DC2} - U_{C0}}{R_2} e^{-\frac{t}{\tau}}; u_C(t) = V_{DC2} (1 - e^{-\frac{t}{\tau}}) + U_{C0} e^{-\frac{t}{\tau}}$ where $\tau = R_2 \cdot C$
- ▶ d) Figure 2

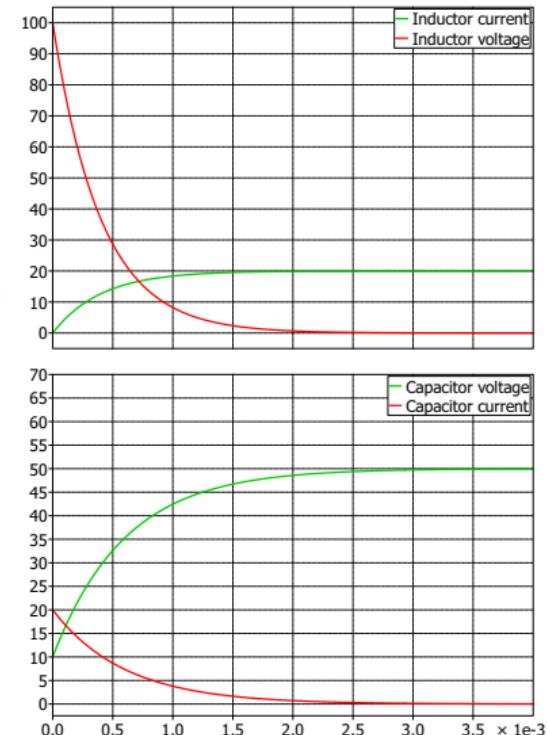


Figure 2 Waveforms