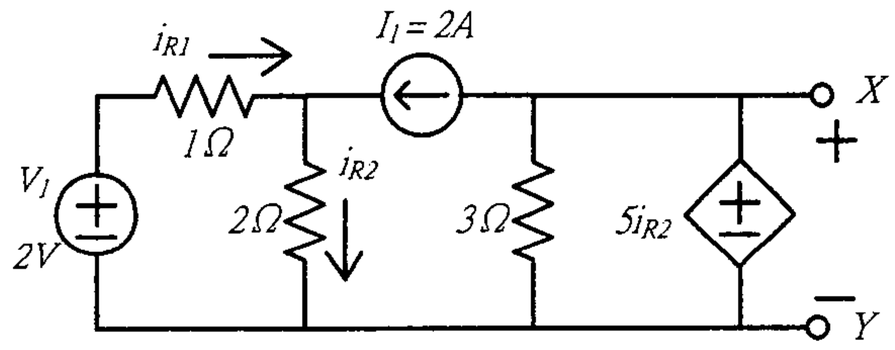
※請在答案卷內作答

一. Based on the following circuit, determine

(一) i_{R1} with node analysis, (10%)

(二) i_{R1} with superposition principle, (10%) and

(三) a Thévenin Equivalent Circuit looking from port X-Y. (10%)

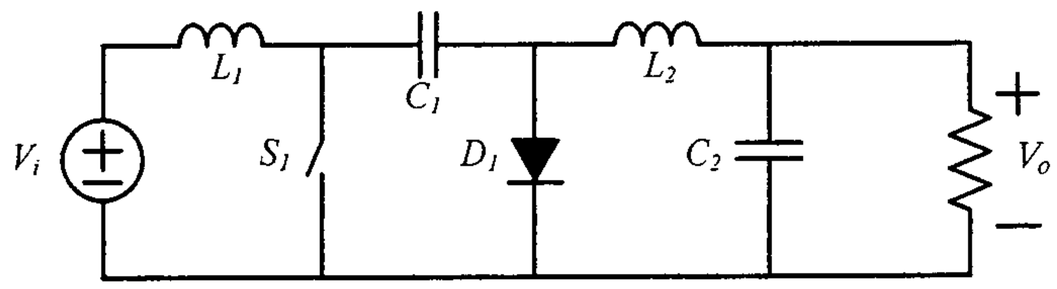


二. Based on the Ćuk converter shown as follows,

(一) describe its operational principle of power transfer from input to output, (5%)

(二) determine the input to output voltage transfer ratio (V_o/V_i) with volt-second balance principle, (10%) and

(三) sketch the converter circuit with the two inductors, L_1 and L_2, coupled on the same core. (5%)

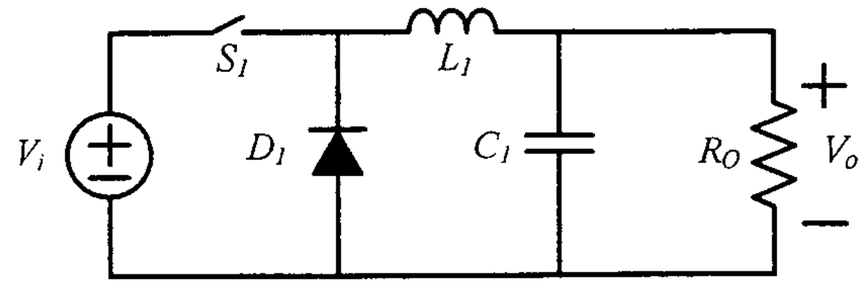


S_1: duty ratio D

三. A buck converter with switching period T_s and duty ratio D is shown as follows,

(一) determine the minimum inductance for boundary mode operation which is corresponding to the minimum power $P_{o,m}$, (5%) and

(二) determine the voltage ripple of output voltage V_o in continuous conduction mode. (5%)



注意:背面有試題

參考用

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四. A three-phase, 60 Hz, balanced, Y-connected voltage source with $E_{ab} = 480\angle 0°$ volts is applied to a balanced-Δ load with $Z_\Delta = 30\angle 40°\ \Omega$. The line impedance between the source and load is $Z_L = 1\angle 85°\ \Omega$ for each phase. (20%)

(一) Please draw the equivalent circuit of the corresponding single-phase system with the appropriate system parameter data. (4%)

(二) Calculate the line current and the Δ-load current. (4%)

(三) Find the voltages at the load terminal. (4%)

(四) Find the total real and reactive power consumptions at the load side. (4%)

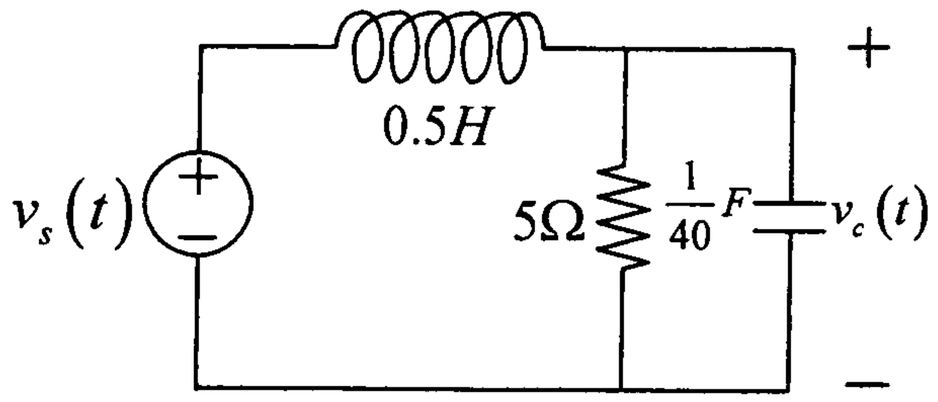
(五) Find the capacitance of the capacitor connected across the Δ-load to improve the overall power factor of the load to 0.95 lagging. (4%)

五. Find the capacitor voltage $v_c(t)$ of the given circuit. The excitation is

$$v_s(t) = \begin{cases} -20V, & t < 0 \\ 20V, & t \geq 0 \end{cases} \quad (10\%)$$

(一) Perform your analysis in the time domain to find $v_c(t)$

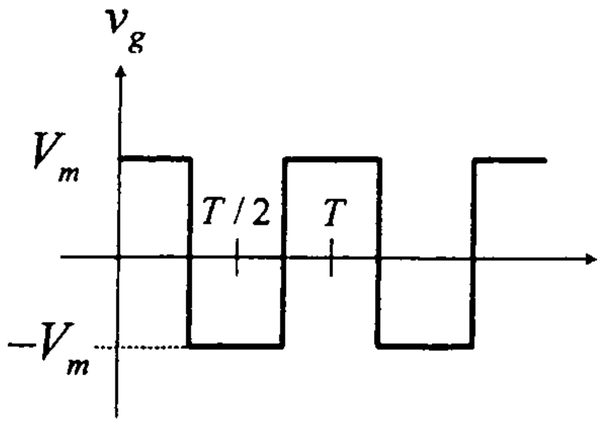
(二) Perform your analysis in the s domain of the Laplace transform and find $v_c(t)$.

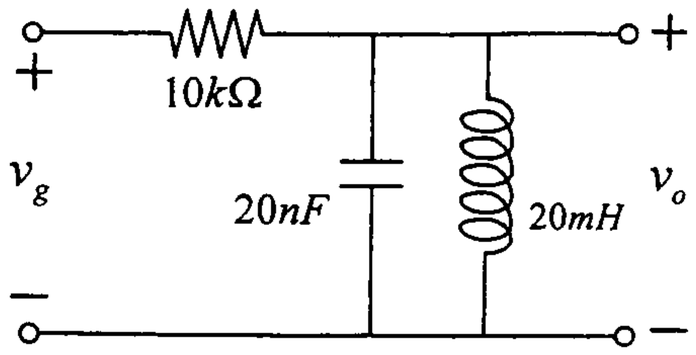


六. The periodic square wave $v_g(t)$ is applied to the circuit. The magnitude of $v_g(t)$ is V_m, and its period $T = 0.0002\pi\ sec.$ (10%)

(一) Calculate the first four non-zero terms in the Fourier series of $v_g(t)$.

(二) Calculate the first four non-zero terms in the Fourier series of $v_o(t)$.





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