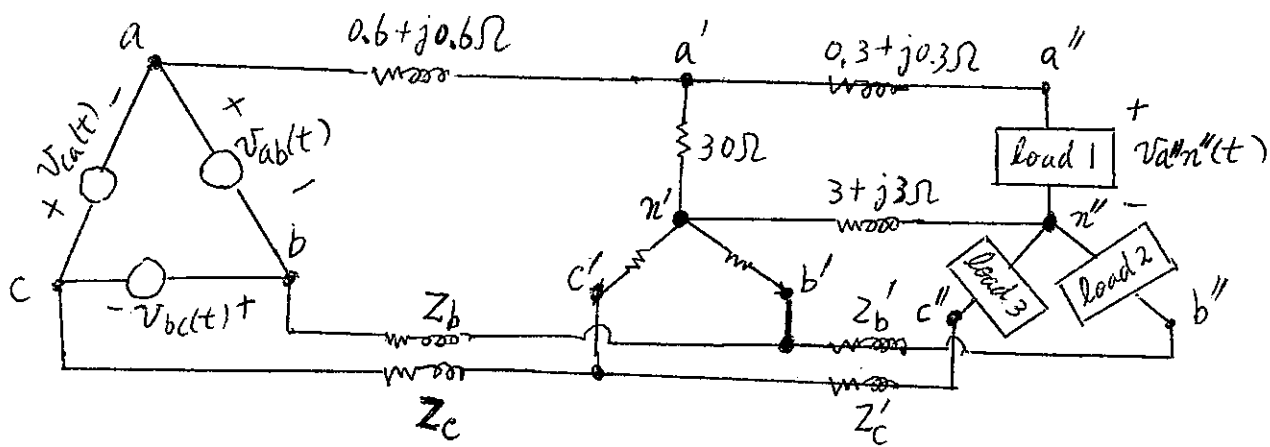
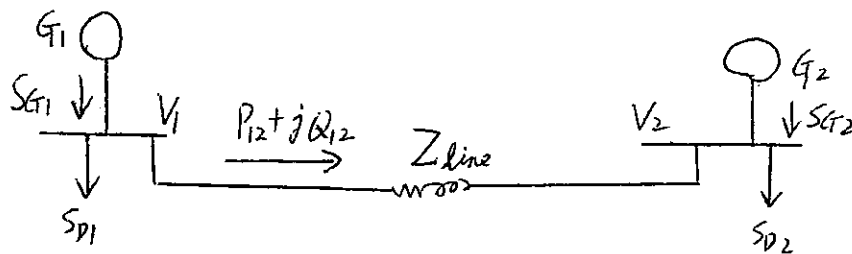


1. Given the 60 Hz, balanced three-phase system shown below, find Z_b, Z'_b and $v_{ab}(t)$ when the system delivers a real power of $P = 800$ W at a power factor of 0.9 lagging to each of the three loads (load 1, load 2, and load 3). Assume that $v_{a'n''}(t) = 110\sqrt{2} \cos 377t$ (V). (11%)



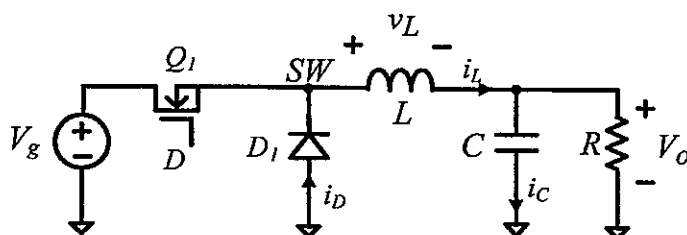
2. Let $|V_1| = 1.05$, $|V_2| = 1.0$, $Z_{line} = 0.7 \angle 85^\circ$. Find the maximum value of P_{12} . (11%)



3. The resistance and inductance of a 60 Hz, 5 Km long, three phase distribution line are $R = 3 \times 10^{-4}$ ohm/m and $L = 1.2 \times 10^{-6}$ H/m, respectively. The capacitance can be neglected. The distribution line delivers a three phase load of 1.5 MW at a power factor of 0.95 lagging at the receiving end. Find the sending end voltage (line to line) when the receiving end voltage is 11KV (line to line). (11%)

見背面

- 4.(20%) The rotor of a six-pole synchronous generator is rotating at a mechanical speed of 1200 r/min
- (a) What is the frequency of the generated voltage in hertz(Hz)?
- (b) Express the mechanical speed in radians per second (rad/sec).
- 5.(13%) The nameplate on a 460-V, 50 Hp, 60 Hz, four-pole induction motor indicates that its speed at rated load is 1755 r/min. Assume the motor to be operating at rated load. What is the frequency (Hz) of the rotor currents?
6. A buck converter below operates at a steady state. Assume the converter is ideal. $V_g = 10\text{V}$, $V_o = 1\text{V}$, $L = 100 \mu\text{H}$, $C = 1 \text{ mH}$, Switching frequency $f_s = 100 \text{ kHz}$. The value of output resistance R makes the converter operate at boundary conduction mode, where Q1 turns on when the inductor current is zero.



- (a) Please give two explanations as to why this converter cannot provide an output voltage higher than the input voltage. (3%)
- (b) Please draw the equivalent circuit model when switch Q_1 is turned off. Indicate whether D_1 is on or off and explain why. (3%)
- (c) Derive the value of output resistance R . (4%)
- (d) Sketch the time waveforms of D , SW voltage, i_L , V_o . Mark peak and valley values (10%)
- (e) Derive the input to output dc gain (V_g/V_o) when output resistance R is 10 times its original value. (6%)
- (f) During the converter start-up, V_o equals 0 V initially. Please derive the rising and falling slopes of the inductor current when V_o equals 0 V. (4%)
- (g) Draw the Bode plot (gain and phase plots) of the transfer function $T = \frac{10(1+s)}{s+1000}$ (4%)

試題隨卷繳回