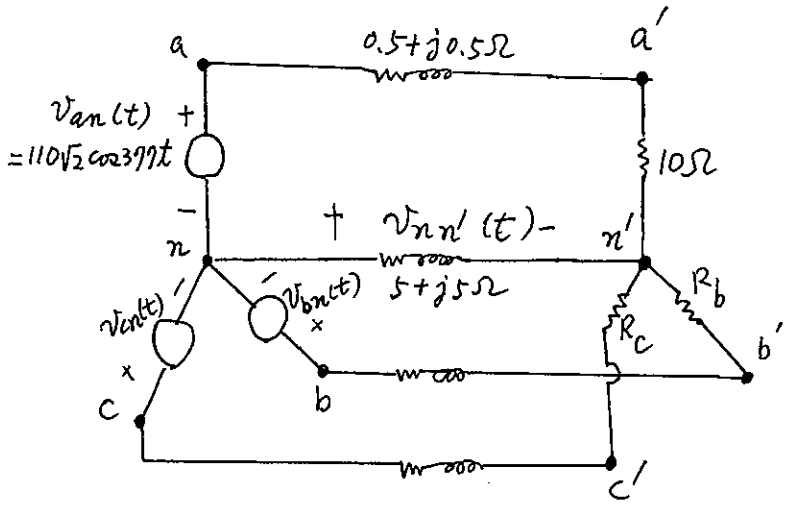
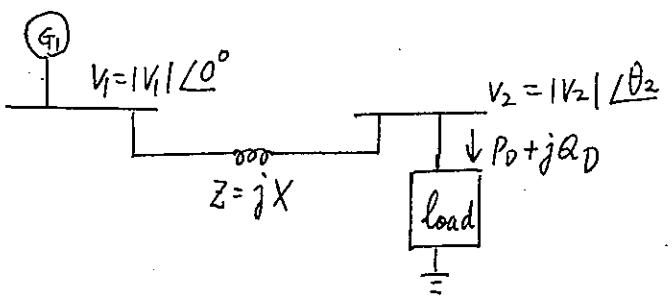
國立臺灣大學 113 學年度碩士班招生考試試題

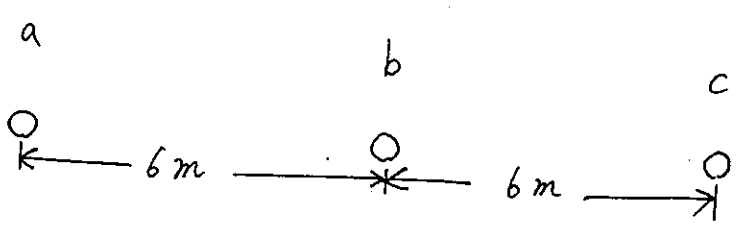
1. Find R_b, $v_{bn}(t)$, and $v_{nn'}(t)$ for the balanced negative-sequence three phase system shown below. (9%)



2. Let $|V_1|$= 1.03, X =0.3, P_D =0.3. Find $|V_2|$ when load power factor is 0.97 lagging. (12%)



3. Consider the 60 Hz, 345 KV, completely transposed, balanced three phase lines as shown below. The radius of each conductor is 1.1 cm. Find the per phase inductance in H/m and per phase capacitance to neutral in F/m. (12%)



見背面

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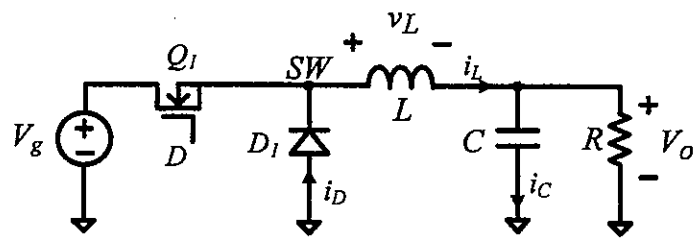
4. A buck converter below operates at a steady state. Assume the converter is ideal except switch Q_1 has a 1V forward voltage drop during turn-on. V_g =10V, V_o =1V, L =100μH, C is very large, Switching frequency f_s =100kHz, Output Resistance R =0.1 ohm.



(a) Please define the "steady state" of a converter. (3%)
(b) Derive the input to output dc gain (V_g/V_o) as a function of duty cycle D. (5%)
(c) Sketch the time waveforms of D, SW voltage, i_L, i_C. Mark peak and valley values (9%)
(d) At what value of R will the converter operate at the boundary conduction mode? (4%)
(e) Assume the switching network (Q_1 and D_1) of the buck converter is modified and SW voltage is connected to $2V_g$ during on-time and V_g during off-time. Please derive the input to output dc gain (V_g/V_o) as a function of duty cycle D. (6%)

5. Answer the below questions. Explanation or mathematic derivations are required.
(a) Why the integration of the capacitor current over a switching period at steady-state is zero? (3%)
(b) Draw the Bode plot (gain and phase plots) of the transfer function $\mathrm{T} = \frac{1}{s+1000}$ (4%)

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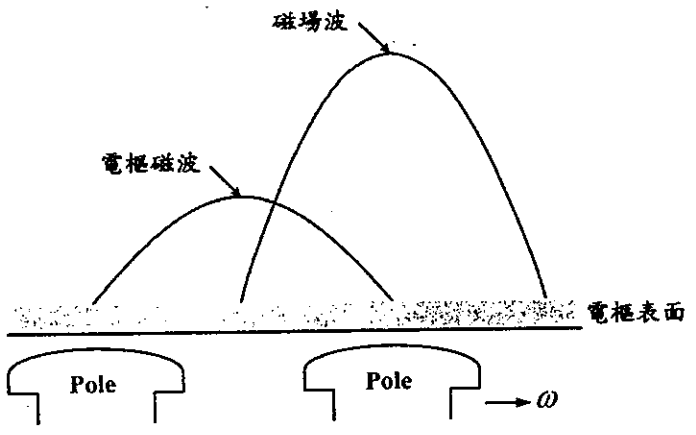
6. 一交流旋轉電機共有極數 24 極，若轉子轉速為 300rpm(rotation per minute)，則定子電流頻率為幾 Hz?(20%)

7. 請畫出以下圖同步機之 E_{af} 、 I_a 、 Φ_f 相量圖(Phasor diagram)，並解釋之。(13%)



試題隨卷繳回