國立雲林科技大學
100學年度碩士班暨碩士在職專班招生考試試題

系所：電機系
科目：電路學與電力系統

1. (20%)

In Fig. 1, switch S_1 is closed at t=0. Switch S_2 is opened at t=4ms. Obtain i for t>0.

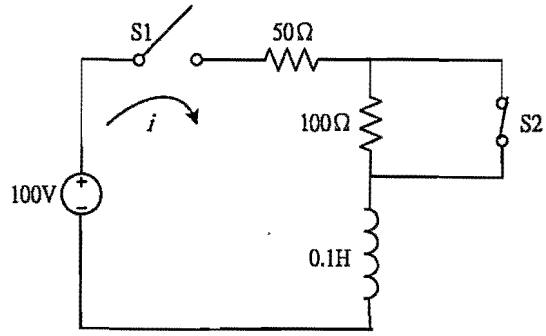

Fig. 1

2. (20%)

In the circuit of Fig. 2 find v_c (the voltage at node C), i_1, R_{in} (the input resistance seen by the 9V source), v_2, and i_2.

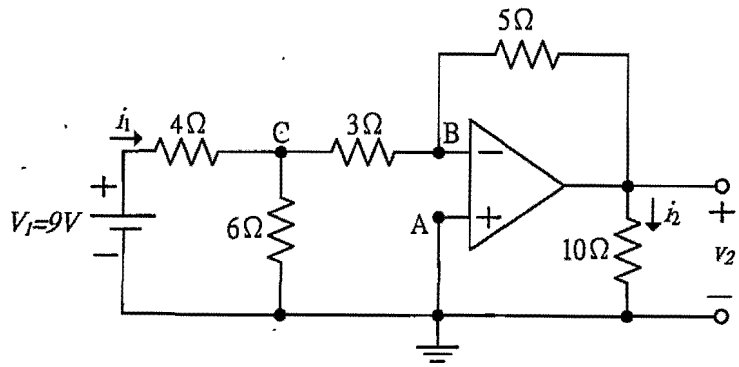

Fig. 2

3. (10%)

Obtain the complete power triangle for the circuit shown in Fig. 3, if the total reactive power is 2500 var (inductive). Find the branch powers P_1 and P_2.

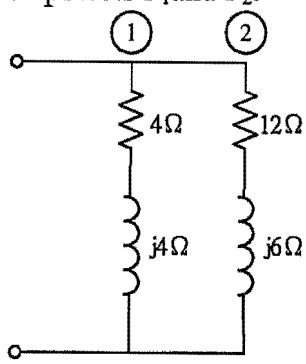

Fig. 3

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4 Synchronous Generator

A 60 Hz, 14-pole, Y-connected, three-phase synchronous generator is rated at 250 MVA, 25.0 kV, power factor 0.9 lagging. The reactances X_d and X_q of this salient-pole synchronous generator are 0.83Ω and 0.57Ω respectively. The armature resistance and all rotational losses can be neglected.

4.1 (7%) Please sketch the phasor diagram for the internal generated voltage E_A, the armature current I_A, the terminal voltage V_t, the d-axis current I_d, the q-axis current I_q, and the power angle δ.

4.2 (7%) What is the internal generated voltage under this rated conditions?

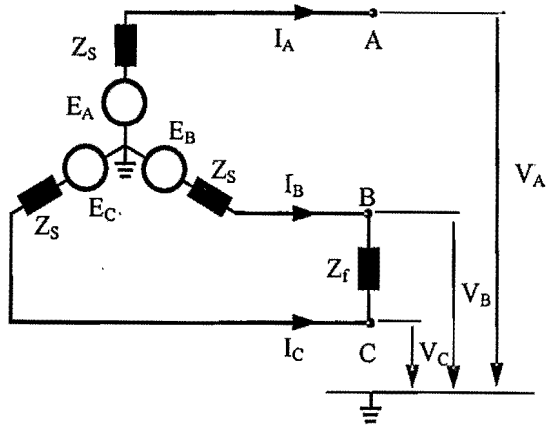
4.3 (6%) What is the power angle δ so that the generator can supply maximal power? And what is the maximal power?

5 Unsymmetrical Faults: Line-To-Line Fault

A three-phase generator with a fault through an impedance Z_f between phases B and C as shown in Fig. 5. Assume that the generator is on no-load.

5.1 (8%) Please use the symmetrical components analysis to find the fault current in term of zero-, positive-, and negative-sequence impedance (Z_o, Z_+, Z_-) and Z_f.

5.2 (7%) Sketch the sequence network connection for this line-to-line fault.



Symmetrical Components :
zero-sequence : Z_o, I_o, V_o
positive-sequence : Z_+, I_+, V_+
negative-sequence : Z_-, I_-, V_-

Fig. 5

6 Transmission Lines: Steady-State Operation

A three-phase, 60-Hz, completely transposed 345-kV, 170-km line has two 795,000-cmil (403 mm^2) 26/2 ACSR conductors per bundle and the following positive-sequence line specific constants: $z' = 0.017 + j0.223$ Ω/km, $y' = j3.7 \times 10^{-6}$ S/km. Full load at the receiving end of the line is 750 MW at 0.98 p.f. lagging and at 91% of rated voltage. Assuming a medium-length line, determine the following:

6.1 (7%) *ABCD* parameters of the nominal π circuit.

6.2 (8%) Sending-end voltage V_s, current I_s, and real power P_s.