國立中山大學100學年度碩士班招生考試試題

科目：電路學【電機系碩士班丁組】

1.(10pt)A battery is discharged by a constant current 5A for 5 hours. If the terminal voltage of the battery is $(12-0.2t)$ V, where t is in hour. Draw output power-time and output energy-time waveforms of the battery for $0<t<5$, respectively.

2.(10pt) For a balanced three-phase system, a-phase voltage and current are described as $v_a(t)=100cos\omega t$V, $i_a(t)=10sin(\omega t+60^o)$A. Find power factor, instantaneous power, average power, reactive power, apparent power of this balanced three-phase system.

3.(10pt) The voltage $v(t)=5+3cos(t+30^o)+sin(3t+20^o)+cos(5t+10^o)$V is applied to a 5Ω resistor. Calculate the rms current flowing through the resistor and power consumption on it.
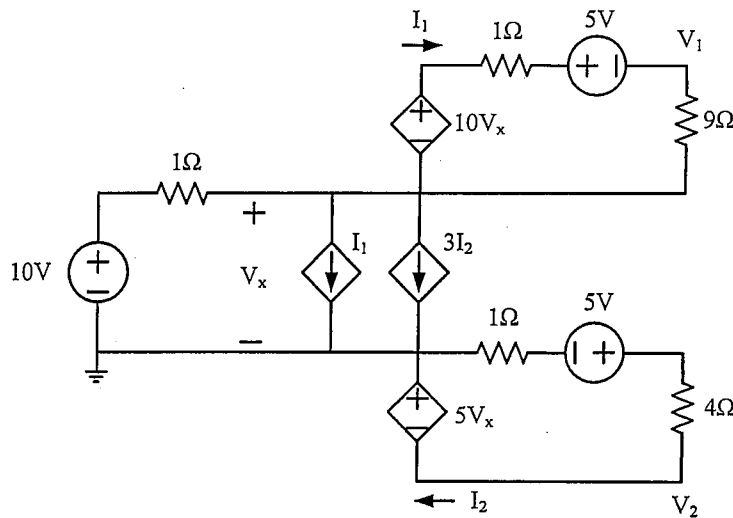
4.(10pt) Find V_1 and V_2 in Fig. 1.

Fig. 1

5.(20pt) Assume the circuit of Fig. 2 is at the steady state before $t=0$s. The ideal switches S_1 is open at $t=0$s. Find $i(t)$ and $v(t)$ for $t>0$ if R=0 and R=4Ω, respectively.
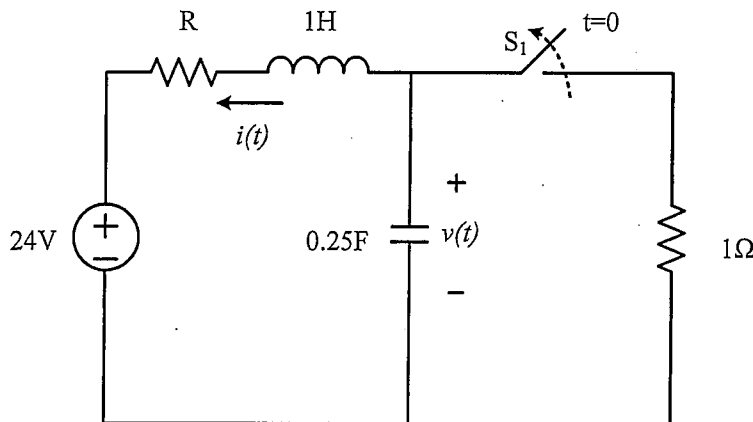

Fig. 2

6.(20pt) Calculate average power on all resistors and reactive power on all reactive components in the circuit of Fig. 3.
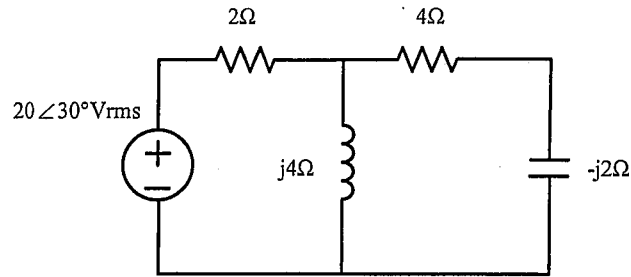

Fig. 3

7.(10pt) In Fig. 4, the turn ratio of the ideal transformer is 1:2. Find V_o and complex power supplied by the source.
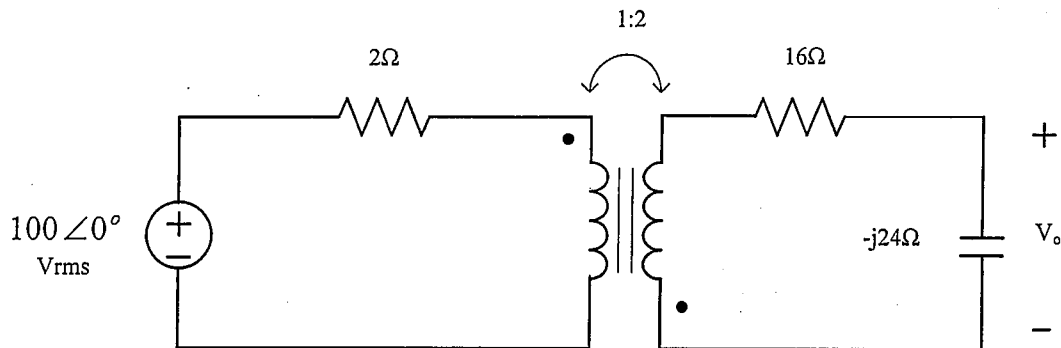

Fig. 4

8.(10pt) Solar energy is becoming increasingly popular recently. Generally, variable power with low dc voltage is produced by the solar panel. So, please describe how to use <u>power electronics converters</u> to deliver the generated power to <u>the utility grid</u>.