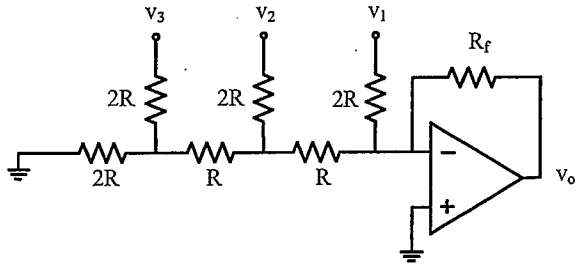
國立中山大學102學年度碩士暨碩士專班招生考試試題

科目名稱：電路學【電機系碩士班丁組】　　題號：431006

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）　　

1. (10pt) A rechargeable battery is capable of delivering 100mA for 10 hours. How much charge can it release at that rate? If the terminal voltage is assumed as 3V, how much energy can the battery deliver?
2. (10pt) Find v_o of the following circuit. Assume ideal OP amplifier.

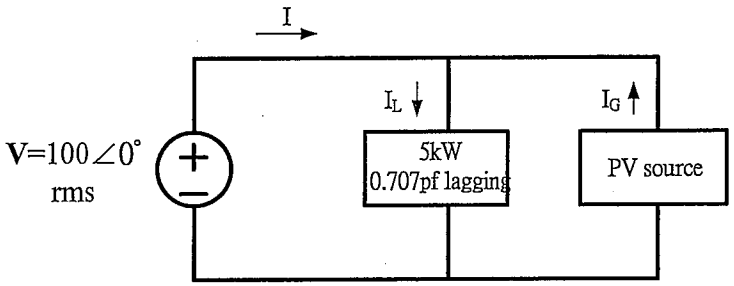
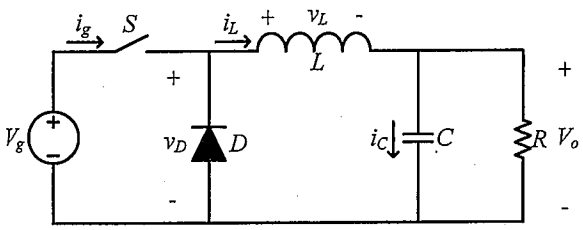


3. (10pt) A balanced Y-connected load is connected to the generator by a balanced transmission line with impedance of 0.1+j0.2Ω per phase. The load is rated at 500kW, 0.866 power factor lagging, $254V_{rms}$ phase voltage. Find line current and line voltage of the generator, respectively?

4. (10pt) Phase voltage and phase current of a load are given as $v(t)=141\cos\omega t$V, $i(t)=14\sin(\omega t+30^o)$ A. Find average power and reactive power of the load.

5. (10pt) If $i(t) = 1 + 5\cos(t+10°) + 3\cos(3t+35°)$ A flows into a resistor 10Ω, find
   (a) RMS current. (5pt)
   (b) Average power consumed by the resistor. (5pt)

6. (20pt) Assume the PV is a current source inverter to deliver 1kW average power to the system.
   (A)Calculate I. (5pt)
   (B)Calculate I_L. (5pt)
   (C)Calculate power factor. (5pt)
   (D)How to improve the power factor to 0.95. (5pt)



7. (30pt) A buck converter is given with the following parameters: Vg=20V, Vo=12V, the switching frequency of S is 10kHz, output power is 100W.
   1.Find minimum inductance L to keep the converter operated in continuous conduction mode.(10pt)
   2.Ripple current on the inductor. (10pt)
   3.Draw waveforms of both diode voltage and inductor current. (10pt)