

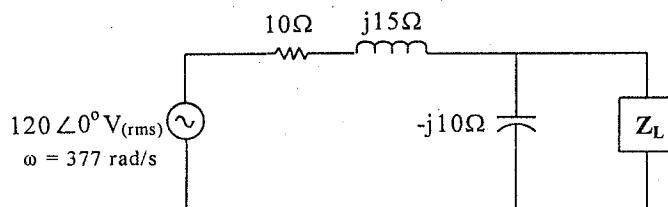
# 淡江大學八十七學年度碩士班入學考試試題

系別：機械工程學系

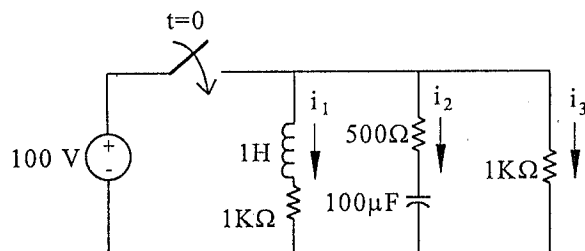
科目：電路電子學

本試題共 2 頁

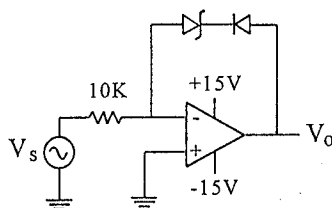
- (20%) All the values shown in the following circuit are in rms, calculate:
  - the value of  $Z_L$  that will absorb the maximum average power?
  - continue from a), what is the value of the maximum average power?



- (20%) In the circuit shown below, what is the value of  $i_1, i_2, i_3$  after the switch has closed for a long time?



- (20%) The input of the following Op-Amp circuit is  $V_s = 2 \sin(2\pi t)$ , the power supply to the Op-Amp is +15 and -15 Volts, and the reverse breakdown voltage of the Zener diode is 5 Volts. Calculate and plot  $V_o$  waveform for 1 cycle of the input voltage?



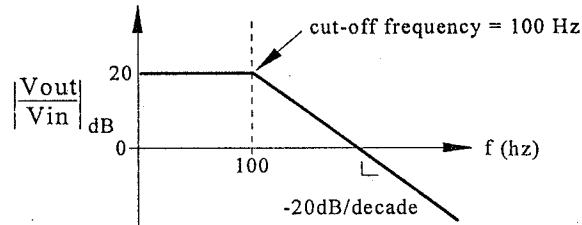
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4. (20%) Use Op-Amp to design a filter with the following frequency response. (hint: use  $0.01 \mu\text{F}$  capacitor)



5. (20%) The following circuit shows a transistor driven relay(繼電器). The relay is turned on when input to the transistor equals 5 Volts, and is turned off when the input voltage is 0 Volt. The power supply of the circuit is a 12 Volts DC source. The inductance of the relay coil is 0.01 H, and it needs at least  $10 \text{ mA}$  to turn on the relay, but the current can not exceed 20 mA for safety. The parameters of the transistor are:  $\beta = 100$ , saturation voltage  $V_{sat} = 0.3 \text{ Volts}$ , and  $V_{be} = 0.7 \text{ Volts}$  for transistor on.

- a) Calculate the range of R that can be used for the circuit?  
b) What is the purpose of the diode across the relay coil?

