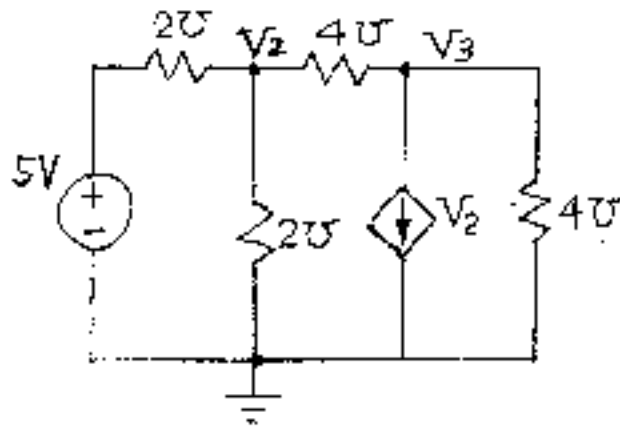


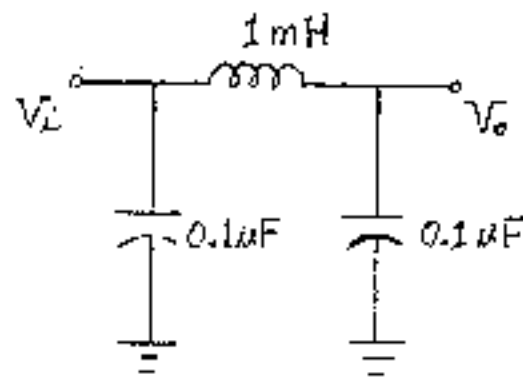
八十五學年度 動力機械 系(所) Z1 組碩士班研究生入學考試

科目 電工學 科號 2602 共四頁第一頁 *請在試卷【答案卷】內作答

- (1) (a) Please solve the following linear circuit by using only Kirchhoff's Current Law for the unknown V_2 and V_3 . (5%)
 (b) For a π filter circuit with two capacitors and one inductor, please derive the frequency response of the given circuit. (5%)

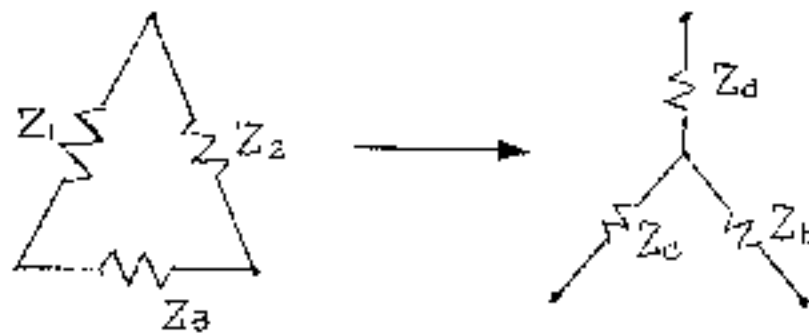


(a)

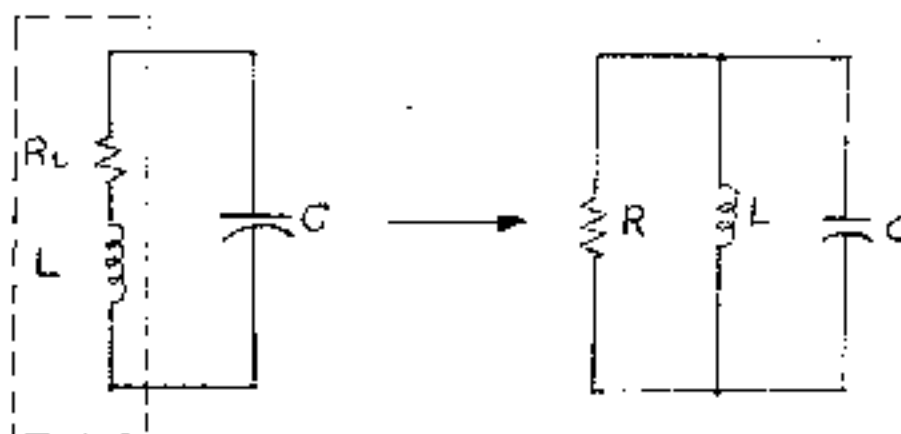


(b)

- (2) (a) In elementary circuit analysis, one has to rely on the assumption of linearity of circuit elements. Please explain it and show two examples of the usefulness of the assumption. (5%)
 (b) Please derive the Δ - Y transformation by using the following definition terms. (Hint: $Z_a = f(Z_1, Z_2, Z_3)$) (5%)



- (3) For a very high Q inductor, the series resistance is very small compared to the reactance value. Please derive the equivalent circuits for a high Q resonance circuit given as follow. (10%)



八十五學年度 動力機械 系(所) 乙 組碩士班研究生入學考試

科目 電工學 科號 2602 共四頁第 二 頁 *請在試卷【答案卷】內作答

- (4) On a commercial audio speaker system, the impedance is measured and shown as

$$Z = R + j\omega L (\Omega)$$

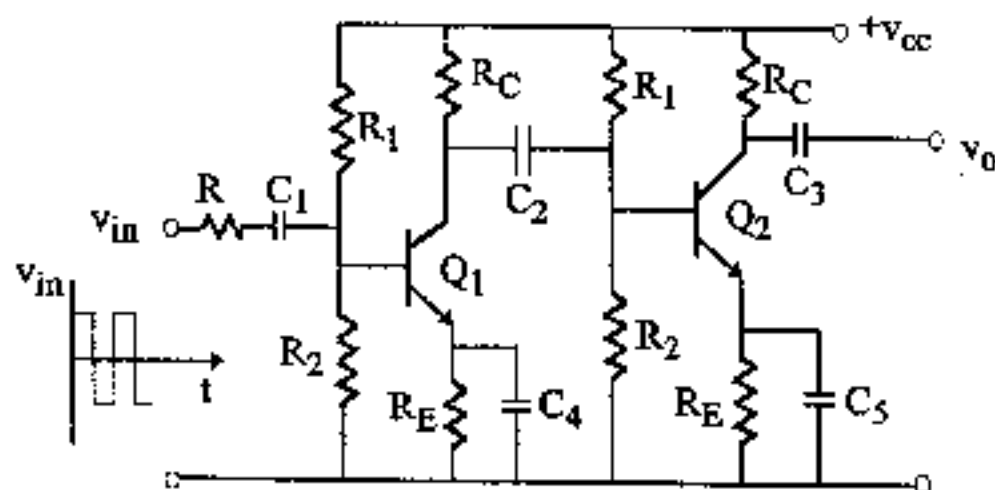
where ω is the angular frequency, $R = 4 \Omega$, and $L = 1.0 \text{ mH}$.

- Find the power factor of the speaker system when 1 kHz sinusoidal signal is applied on the terminal. (5%)
- At maximum power transfer between the power amplifier and the speaker system, what is the best output impedance value on the power amplifier? (5%)
- If a capacitor is connected in parallel with the speaker terminals, what is the best capacitance when unity power factor is required? (5%)
- The speaker system is rated for 100 W(RMS) at midrange frequency (1 kHz-5 kHz), what is the voltage range on the terminals? (5%)

- (5) For the figure as shown below, describe the symptoms you might encounter for the following trouble (consider independently) while measuring v_o :

- C_1 open. (3%)
- C_2 open. (3%)
- C_3 shorted. (3%)
- C_4 shorted. (3%)
- C_5 open. (3%)

Note: Assume reasonable values for whatever data (e.g. β or h_{FE}) if needed, and provide necessary calculation to clarify your answer(s).

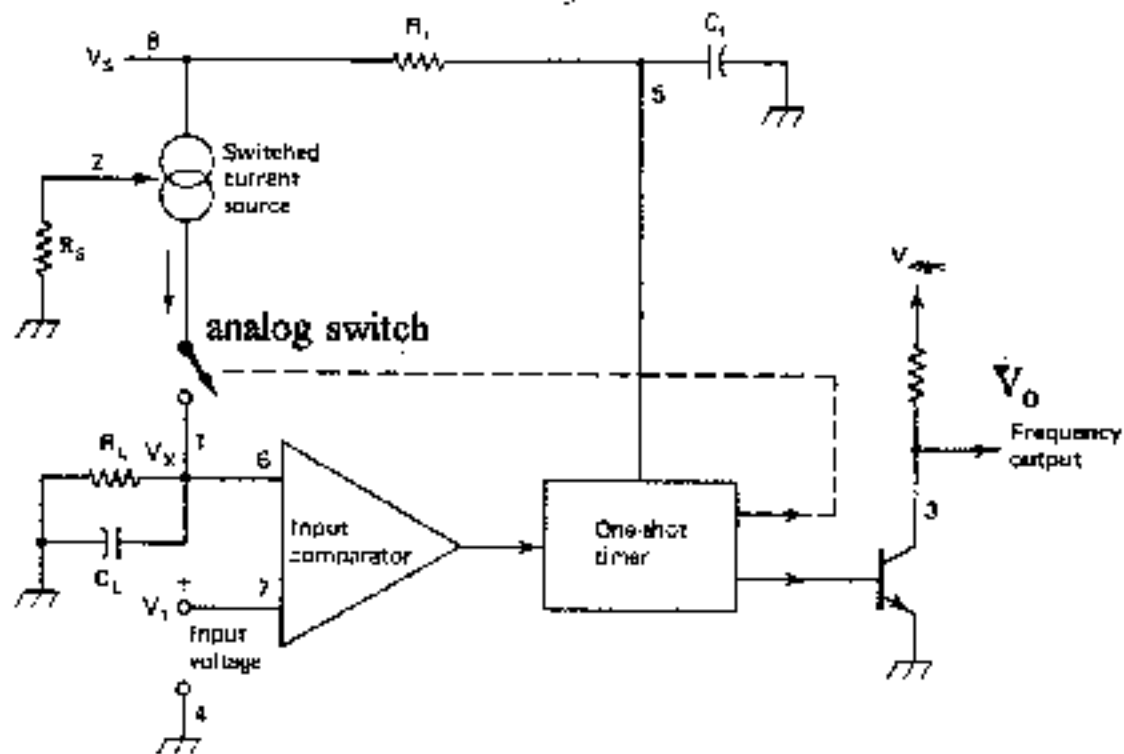


八十五學年度 動力機械 系(所) 乙 組碩士班研究生入學考試

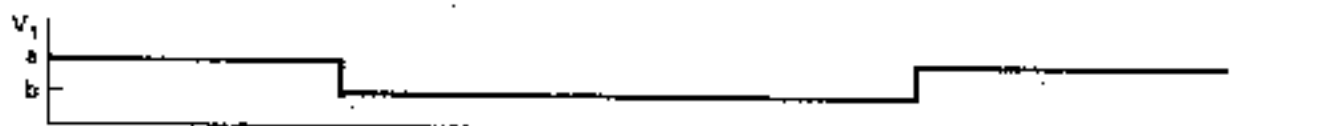
科目 電子學 科號 2602 共四頁第三頁 *請在試卷【答案卷】內作答

(6) For the schematic diagram of a voltage-to-frequency circuit as shown below, in which the one-shot timer will control charging current flowing to the capacitor C_L through an analog switch. Now, if an input waveform V_1 is given, please plot the corresponding waveforms of V_x and V_o , respectively. (20%)

Note: Provide necessary assumptions and calculations to support your answer(a).



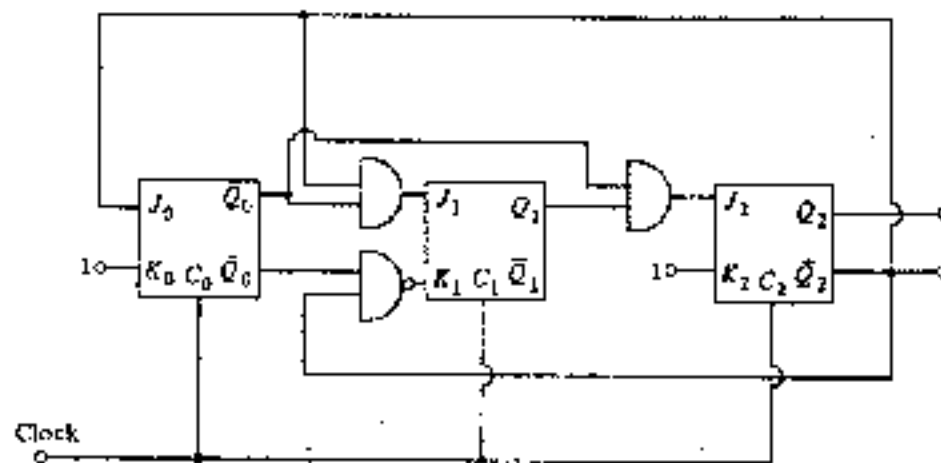
input waveform



八十五學年度 動力機械 系(所) 乙 組碩士班研究生入學考試

科目 電工學 科號 2602 共 四 頁第 四 頁 *請在試卷【答案卷】內作答

- (7) For a counter circuit as shown below, a clock pulse-train is fed in as a triggering signal, plot the corresponding output waveforms for Q_0 , Q_1 and Q_2 . (15%)



clock pulse-train

