國立暨南國際大學九十二學年度碩士班研究生入學考試試題

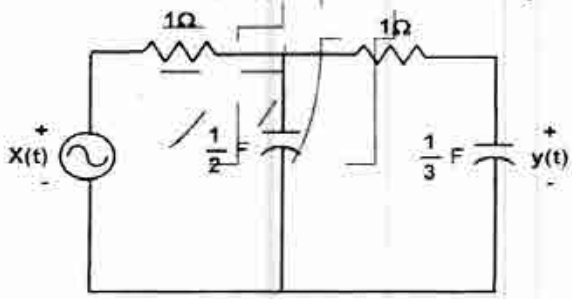
第 2 節電路學 適用:(電機所電子組 422)

考生注意: 1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分，並限以藍黑色筆作答。
3. 試題隨卷繳回。(餘請詳閱試場規則)

1. (a) Consider the circuit, if the input voltage source x(t) = sin 2t , and y(0) = y'(0) = 0. Please find the voltage response y(t). (15%)

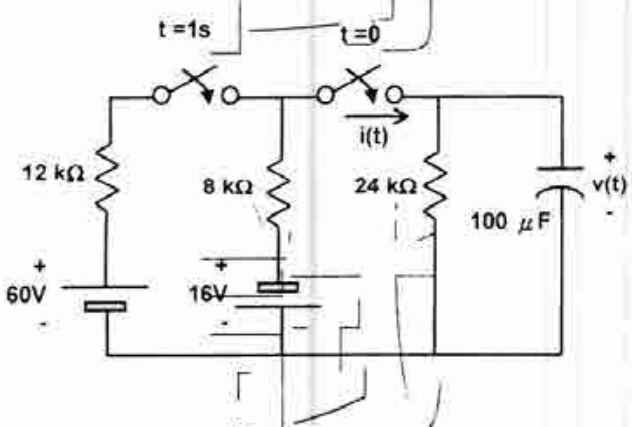
(b) Please use SPICE to describe this circuit and its analysis. (6%)

Figure 1



2. Both switches have been open for a long time. The switch on the right closes at t = 0, and the switch on the left closes at t = 1s. Please draw the resulting transient waveforms v(t) and i(t). (20%)

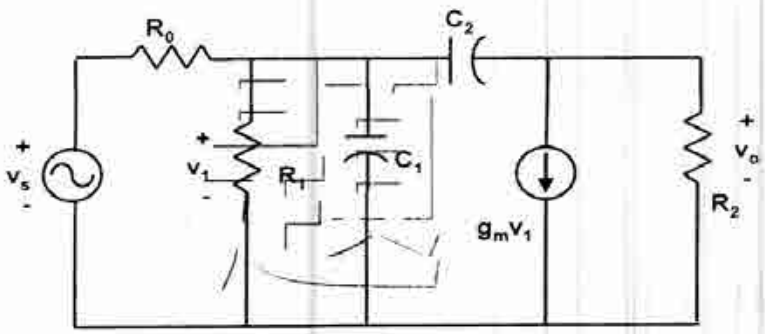
Figure 2



3. Find the voltage gain $A_v(s) = V_o(s) / V_s(s)$. (15%)

How many poles and zeros? (5%)

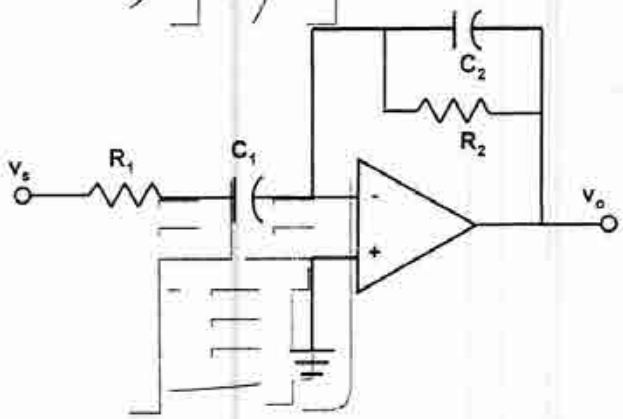
Figure 3



4. (a) Find the transfer function $H(s) = v_o(s) / v_s(s)$. Show that it is a bandpass filter. (15%)

(b) For $R_1C_1 >> R_2C_2$, with passband 20 ~ 20,000 Hz, gain = 10, and $R_1 = 0.8$ kΩ, please find C_1, R_2, and C_2. (6%)

Figure 4



5. True or False? If it is false, please correct it. (18%)

(a) Kirchhoff's voltage law expresses conservation of charge in terms of voltage rises and drops around a loop.

(b) Two different networks are duals when the i-v equations that describe one of them have the same mathematical form as the i-v equations for the other with voltage and current variables interchanged.

(c) A load network is any two-terminal network that contains no independent sources. If controlled sources are included, then the control variables must be within the same network.

(d) A circuit is linear when it consists entirely of linear elements and dependent sources.

(e) Norton's theorem states that any linear resistive source network acts at its terminals like an ideal current source in series with a resistor.

(f) A capacitor stores energy in a magnet field produced by displaced charge on the plates. The voltage across it cannot change discontinuously when the current remains finite.