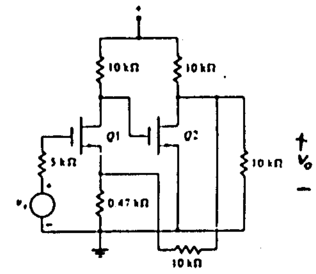
國立成功大學 81 學年度 電工所 碩士班 (乙) 考試 (電子學 試題) 共 1 頁 第 1 頁

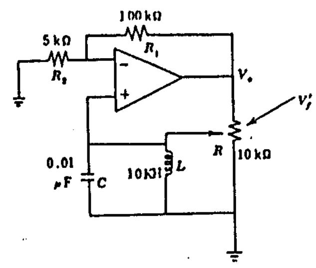


1. (15 %) For MOSFET Q_1 and Q_2, $g_m = 1$ m℧ and $r_d = 2$ KΩ, determine A_{OL} (open-loop), A_F (feedback), and T ($=A_{OL}\,\beta$).

2. (15 %)

   (a) Draw the circuits of N-bit D/A converter using (1) binary-weighted R and (2) R-2R configurations. Explain the operation and compare these two circuits.

   (b) Explain the resolution error, offset error, and scale error of D/A converter.



3. (20 %) For the Wien-Bridge Oscillator,

   (a) derive the oscillation frequency;

   (b) determine the minimum value of R.

4. (20 %) Fig. 1 shows the circuit of an active filter.

   (a) Determine the V_o / V_i.

   (b) Determine the ω_o.

   (c) For C=0.1 μF, use the circuit to realize the following amplifier:

$$A_v = \frac{K}{s^2 + 0.1s + 1000}$$

   where K $\geq$ 10.

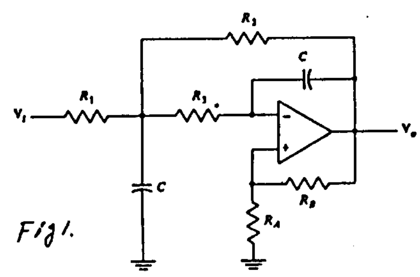
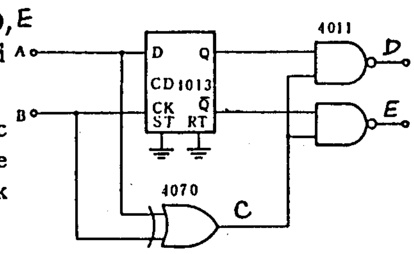


Fig 1.

5. (15 %) Pulse sequence B = pulse sequence A + ϕ.

   (a) For $\phi > 0$ and $\phi < 0$, draw the timing diagram at points A, B, C, D, E and states of Q and $\bar{Q}$. Note that CD 4013 is a positive-triggered D-type Flip-Flop.

   (b) Use this circuit, a miniature propeller, and necessary electronic parts (e.g. reflective LEDs, photocells, OP-Amps, ...) to measure the speed and the direction of air flow in a tube. Draw the block diagram and explain the operation.



6. (15 %) Fig. 2 shows the circuit of a bio-potential amplifier.

   (a) Determine the gain of the instrumentation amplifier (stage 1).

   (b) Determine the CMRR of the differential amplifier (stage 2).

   (c) Determine the upper and lower cutoff frequencies of the bandpass amplifier (stage 3).

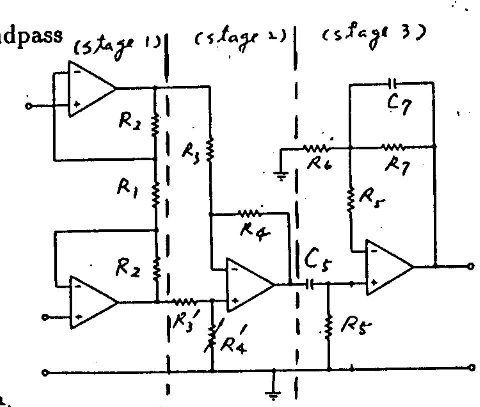


Fig 2.