

國立台灣科技大學九十七學年度碩士班招生試題

系所組別：電子工程系碩士班乙二組、乙三組

科目：電子學

Total 100 points

- (15%) Compared with an 'ideal' op amp with the transfer characteristic shown in Fig. 1(a), please describe the non-idealities of the op amp with a transfer characteristic shown in Fig. 1(b).
- (10%) For the circuit shown in Fig. 2, all diodes are ideal except for that D_1 is burned out to be open-circuited. Assume the input voltage v_s is sinusoidal, please plot the corresponding waveform between input v_s and output v_o .
- (25%) For the CMOS inverter shown in Fig. 3(a), we have $V_{in} = |V_{ip}| = V_t$ and $k'_n(W/L)_n = k'_p(W/L)_p$ where V_{in} , V_{ip} , k'_n , k'_p , are the threshold voltages, process transconductance parameters of NMOS and PMOS respectively. The voltage transfer characteristic is shown in Fig. 3(b). Please derive the noise margins.

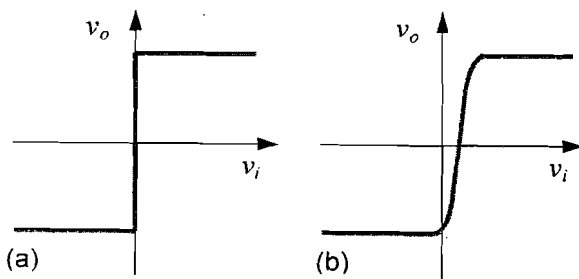


Fig. 1

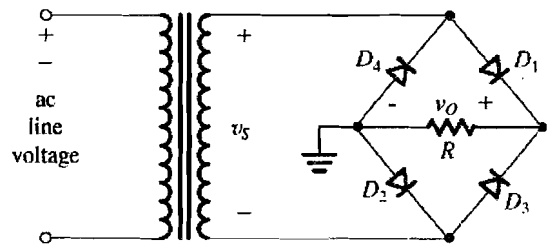
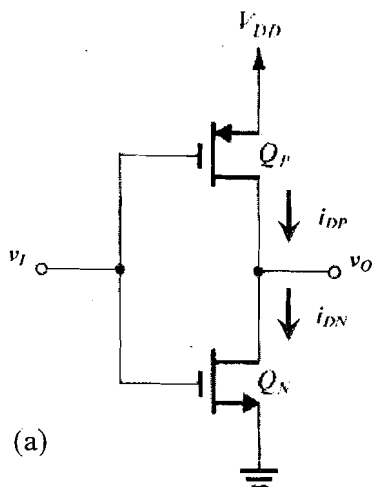
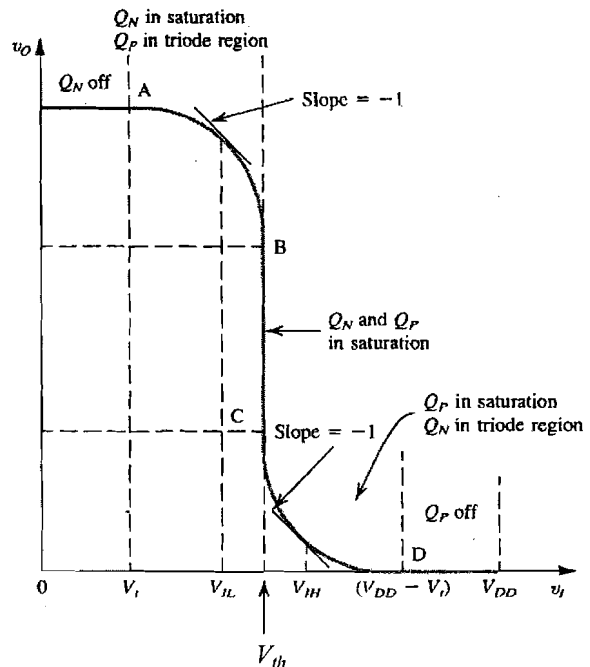


Fig. 2



(a)



(b)

Fig. 3



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4. Refer to the block diagram for 555 IC shown in Figure 4(a), please describe the detailed operating principle and derive the expression of the output pulse width for the monostable multivibrator shown in Figure 4(b). (20%)

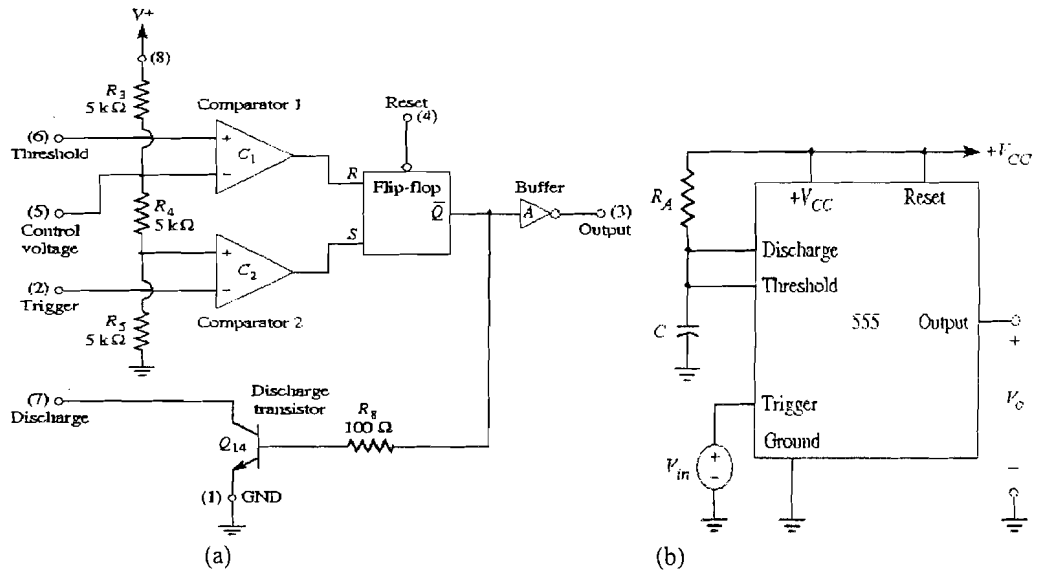


Figure 4

5. Consider the one-pole low-pass filter shown in Figure 5, please depict the equivalent switched capacitor circuit and derive the transfer function and 3dB frequency. (10%)

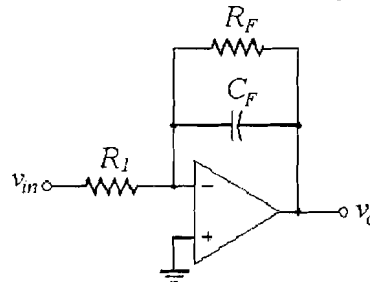


Figure 5

6. Consider the voltage amplifier in Figure 6. The op-amp parameters are $A_v=10^4$, $R_i=50k\Omega$, and $R_o=2k\Omega$, and the transistor parameters are $h_{FE}=200$, $V_A=100$. Determine A_{vF} , R_{if} , and R_{of} . (20%)

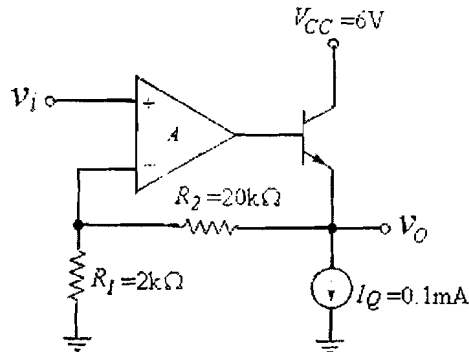


Figure 6

