

핵심이 보이는 전자회로

with PSPICE (개정판)

연습문제 정답(주관식) 이용 안내

- 본 문제 풀이의 저작권은 신경욱과 한빛아카데미(주)에 있습니다.
- 이 자료를 무단으로 전제하거나 배포할 경우 저작권법 136조에 의거하여 최고 5년 이하의 징역 또는 5천만원 이하의 벌금에 처할 수 있고 이를 병과(併科)할 수도 있습니다.

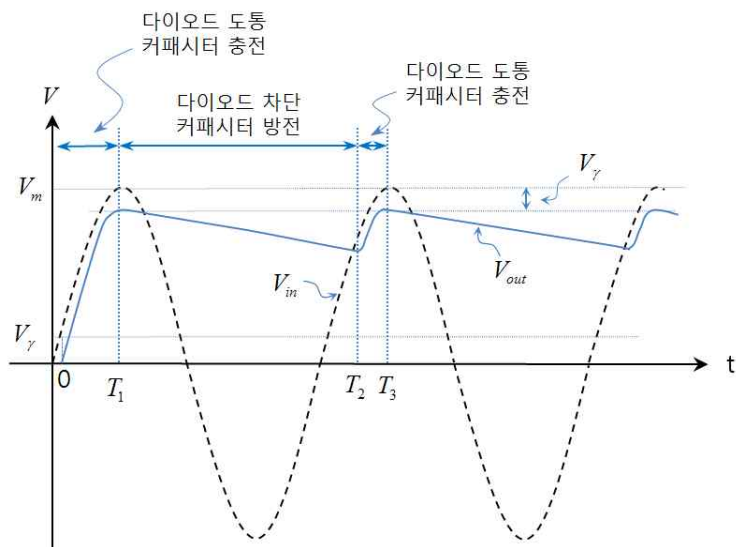
1장. PN 접합 다이오드

[1-36] $V_I = 1.786 \text{ V}$

[1-37] $I_D = 3.54 \text{ mA}$, $V_D = 0.753 \text{ V}$, $P_D = 2.666 \text{ mW}$

[1-38] $I_D = 1.475 \text{ mA}$

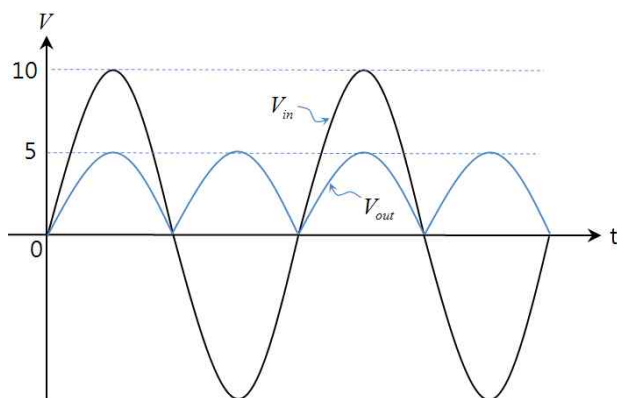
[1-39]



[1-40] $I = 90.45 \text{ mA}$, $V_1 = 21.3 \text{ V}$, $V_2 = 3.21 \text{ V}$, $V_3 = 2.51 \text{ V}$, $V_O = 1.81 \text{ V}$

[1-41] $I = 4.52 \text{ mA}$

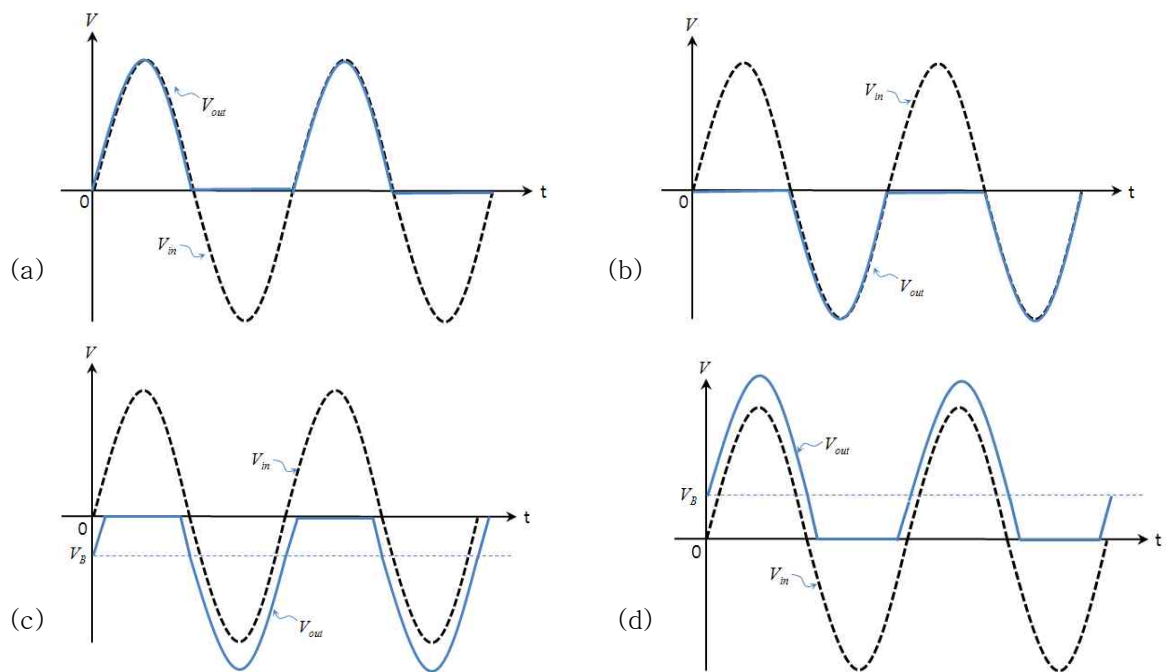
[1-42] (a)



(b) $V_{avg} = 3.18 \text{ V}$

(c) $PIV = 5 \text{ V}$

[1-43]



[1-44] $I_Z = 42.5 \text{ mA}$, $P_Z = 212.5 \text{ mW}$

[1-45] $V_{S,\min} = 7 \text{ V}$, $V_{S,\max} = 14.6 \text{ V}$

2장. BJT 증폭기

[2-56] $I_{BQ} = 9\mu\text{A}$, $I_{CQ} = 2.05\text{mA}$, $I_{EQ} = 2.06\text{mA}$, $V_{ECQ} = 3.9\text{V}$

[2-57] $I_{BQ} = 18.5\mu\text{A}$, $I_{CQ} = 2.85\text{mA}$, $I_{EQ} = 2.87\text{mA}$, $V_{CEQ} = 3.415\text{V}$

[2-58] $R_1 = 122.26\text{k}\Omega$

[2-59] $R_1 = 279.6\text{k}\Omega$, $R_2 = 52.78\text{k}\Omega$

[2-60] $A_v = -9.4\text{V/V}$

[2-61] $R_1 = 558.67\text{k}\Omega$

[2-62] $I_{BQ} = 10.82\mu\text{A}$, $I_{CQ} = 2.48\text{mA}$, $I_{EQ} = 2.49\text{mA}$, $V_{ECQ} = 4.29\text{V}$, $A_v = -6.4\text{V/V}$

[2-63] $I_{BQ} = 7.19\mu\text{A}$, $I_{CQ} = 1.65\text{mA}$, $I_{EQ} = 1.66\text{mA}$, $V_{ECQ} = 5.52\text{V}$, $A_v = 0.99\text{V/V}$

[2-64] $A_v = 9.33\text{V/V}$

[2-65] (a) $A_{v1} = -139.52\text{V/V}$

(b) $A_{v2} = 0.989\text{V/V}$

(c) $A_v = -137.98\text{V/V}$

3장. MOSFET 증폭기

[3-46] $W = 4\mu\text{m}$

[3-47] $I_D = 0.7\text{mA}$, $V_{SD} = 2.2\text{V}$

[3-48] $R_D = 1.2\text{k}\Omega$, $R_1 = 600\text{k}\Omega$, $R_2 = 120\text{k}\Omega$

[3-49] $I_D = 1.2\text{mA}$, $V_O = 3\text{V}$

[3-50] $\frac{W}{L} = 4$

[3-51] $r_d = 20\text{k}\Omega$, $\lambda = 0.0217\text{V}^{-1}$

[3-52] 입력저항 : $R_i = 14.29\text{k}\Omega$

출력저항 : $R_o = 2.83\text{k}\Omega$

$A_v = -2.73\text{V/V}$

[3-53] 입력저항 : $R_i = 60\text{k}\Omega$

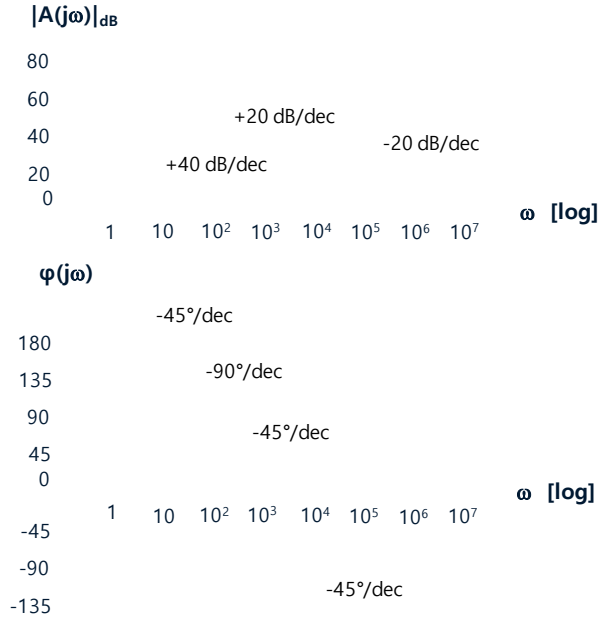
$A_v = 0.81\text{V/V}$

[3-54] $A_v = -3.09\text{V/V}$

[3-55] $A_v = -157.5\text{V/V}$

4장. 증폭기의 주파수 응답 특성

[4-41]



[4-42] $f_\beta = 3.38 \text{ MHz}$, $f_T = 507 \text{ MHz}$

[4-43] $f_T = 44.05 \text{ MHz}$

[4-44] $\tau_o = 28.0 \text{ msec}$, $f_L = 5.68 \text{ Hz}$

[4-45] $C_C = 0.19 \mu\text{F}$

[4-46] $f_L = 382.58 \text{ Hz}$, $f_H = 587.83 \text{ kHz}$

[4-47] (a) $C_M = 6.4 \text{ pF}$, $C_i = 18.4 \text{ pF}$

(b) $f_H = 5.59 \text{ MHz}$

[4-48] (a) $C_i = 1.62 \text{ pF}$

(b) $f_H = 196.49 \text{ MHz}$

[4-49] $C_C = 22.92 \text{ nF}$

[4-50] $f_H = 7.31 \text{ MHz}$

5장. 차동증폭기와 전력증폭기

[5-31] $v_o = 2.003 \text{ mV}$

[5-32] $A_{dm} = -g_m R_C, A_{cm} = \frac{-\beta_o \Delta R}{r_\pi + (1 + \beta_o)(2R_E)}$

[5-33] $A_{dm,vo2} = -3.75, A_{cm} = -49.67 \times 10^{-3}, CMRR = 75.50$ (또는 $CMRR_{dB} = 37.56 \text{ dB}$)

[5-34] $I_{C,\max} = 0.3 \text{ A}, V_{CE,\max} = 30 \text{ V}, P_{D,\max} = 2.25 \text{ W}$

[5-35] 16%

[5-36] (a) $I_{CQ} = 0.136 \text{ A}$

(b) $I_{C,\max} = 0.272 \text{ A}, V_{CE,\max} = 20 \text{ V}, P_{D,\max} = 1.36 \text{ W}$

[5-37] $V_{CC,\min} = 6 \text{ V}$

[5-38] 4.0 W

[5-39] $T_J = 129.9^\circ \text{C}, T_C = 92.1^\circ \text{C}, T_S = 79.5^\circ \text{C}$

[5-40] $P_{D,\max} = 30.9 \text{ W}$

6장. 귀환증폭기

[6-41]

개방루프 이득 (A)	β
$A = 10^2$	0.01
$A = 10^3$	0.019
$A = 10^4$	0.0199
$A = \infty$	0.02

[6-42] $A = 20$, $\beta = 0.00475$

[6-43] $R_{if} = 8\text{M}\Omega$, $R_{of} = 10\Omega$

[6-44] $R_{if} = 0.8\Omega$, $R_{of} = 37.5\text{M}\Omega$

[6-45] (a) 입력 결선: 직렬(series), 출력 결선: 병렬(shunt)

(b) $\beta_v = 1$, $A_{vf} = 1\text{V/V}$

[6-46] 정귀환을 갖는다.

[6-47] (a) 입력 결선: 직렬(series), 출력 결선: 직렬(series)

(b) $\beta_z = 0.5\text{k}\Omega$, $A_{gf} = 2.0\text{mA/V}$

[6-48] (a) 입력 결선: 직렬(series), 출력 결선: 직렬(series)

(b) $\beta_z = \frac{R_{E1}R_{E3}}{R_{E1} + R_F + R_{E3}}$, $A_{gf} = \frac{R_{E1} + R_F + R_{E3}}{R_{E1}R_{E3}}$

[6-49] (a) 입력 결선: 병렬(shunt), 출력 결선: 직렬(series)

(b) $A_{if} = 21\text{A/A}$

[6-50] (a) 입력 결선: 병렬(shunt), 출력 결선: 병렬(shunt)

(b) $A_{zf} = -250\text{k}\Omega$, $A_{vf} = -5\text{V/V}$

7장. 연산증폭기

$$[7-41] \quad R_3 = \frac{R_1 R_2}{R_1 + R_2} = R_1 \parallel R_2$$

$$[7-42] \quad R_3 = 45.5 \text{ k}\Omega$$

$$[7-43] \quad A_v = - \left(1 + \frac{R_3}{R_2} + \frac{R_3}{R_4} \right) \left(\frac{R_2}{R_1} \right)$$

$$[7-44] \quad v_{O1} = \left(1 + \frac{R_2}{R_1} \right) v_I, \quad v_{O2} = - \left(1 + \frac{R_2}{R_1} \right) v_I$$

$$[7-45] \quad v_O = - R_F i_2 = - R_F i_S$$

$$[7-46] \quad 99.47 \text{ mV}$$

$$[7-47] \quad \text{생략}$$

$$[7-48] \quad v_O = - R_2 C_1 \frac{dv_I}{dt}$$

$$[7-49] \quad v_O = - V_T \ln \left(\frac{v_I}{I_S R_1} \right)$$

$$[7-50] \quad 200 \text{ kHz}$$

8장. 응용회로

$$[8-31] \ R_1 = 80 \text{ k}\Omega$$

$$[8-32] \ f_o = \frac{1}{2\pi RC}, \ \frac{R_2}{R_1} = 2$$

$$[8-33] \ 64.16 \mu\text{H} \leq L \leq 256.64 \text{ H}$$

$$[8-34] \ V_R = 1.67 \text{ V}, \ R_2 = 225 \text{ k}\Omega$$

$$[8-35] \ V_{TH} = \left(\frac{R_3}{R_1 + R_3} \right) (v_O - V_\gamma), \ V_{TL} = \frac{-R_3}{R_2 + R_3} (v_O - V_\gamma)$$

$$[8-36] \ V_R = -1.36 \text{ V}, \ R_2 = 50 \text{ k}\Omega$$

$$[8-37] \ V_{TL} = \frac{R_3}{R_2} (v_O - V_\gamma), \ V_{TH} = \frac{R_3}{R_1} (|v_O| - V_\gamma)$$

$$[8-38] \ V_{\min} = \left(1 + \frac{R_1}{R_2} \right) V_R - \frac{R_1}{R_2} V_o, \ V_{\max} = \left(1 + \frac{R_1}{R_2} \right) V_R + \frac{R_1}{R_2} V_o, \ V_{avg} = \left(1 + \frac{R_1}{R_2} \right) V_R$$

$$[8-39] \ V_R = 2 \text{ V}, \ R = 10 \text{ k}\Omega, \ C = 0.1 \mu\text{F}$$

$$[8-40] \ [1.36 \text{ kHz} \leq f \leq 2.58 \text{ kHz}, \ 50.94\% \leq \delta \leq 96.43\%]$$