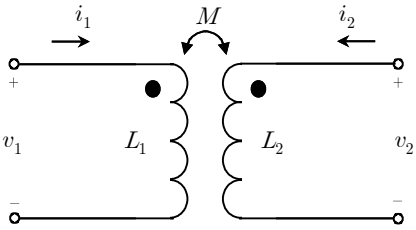
회로이론

문 1. 다음 결합회로에 대한 관계식으로 옳은 것은?



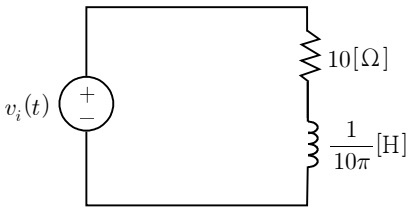
① $v_1 = L_1\frac{di_1}{dt} + M\frac{di_2}{dt}$

② $v_1 = L_1\frac{di_1}{dt} - M\frac{di_2}{dt}$

③ $v_2 = L_2\frac{di_1}{dt} + M\frac{di_2}{dt}$

④ $v_2 = L_2\frac{di_1}{dt} - M\frac{di_2}{dt}$

문 2. 다음 회로의 전압 $v_i(t)$는 rms 크기가 120 [V]이고 주파수가 50 [Hz]인 정현파 전압이다. 이 회로의 역률(power factor)은?



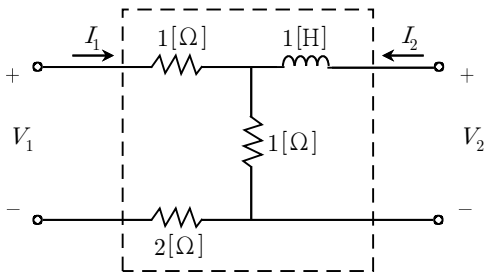
① $\frac{1}{2}$

② $\frac{1}{\sqrt{3}}$

③ $\frac{\sqrt{2}}{2}$

④ $\frac{\sqrt{3}}{2}$

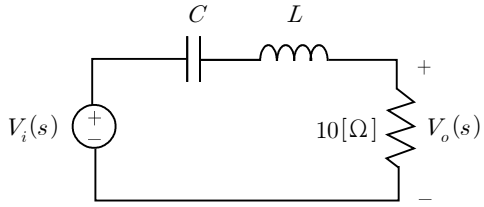
문 3. 다음 회로에 대한 2-포트 임피던스 방정식은?



① $\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 1 & s+1 \\ s+1 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$ ② $\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & s+1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$

③ $\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 4 & s+1 \\ s+1 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$ ④ $\begin{bmatrix} V_1 \\ V_2 \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 1 & s+1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$

문 4. 다음 회로의 전달함수가 $\frac{V_o(s)}{V_i(s)} = \frac{5s}{s^2+5s+10}$가 되기 위한 L[H]과 C[F]의 값은?



① $L=1,\ C=0.05$ ② $L=1,\ C=0.5$

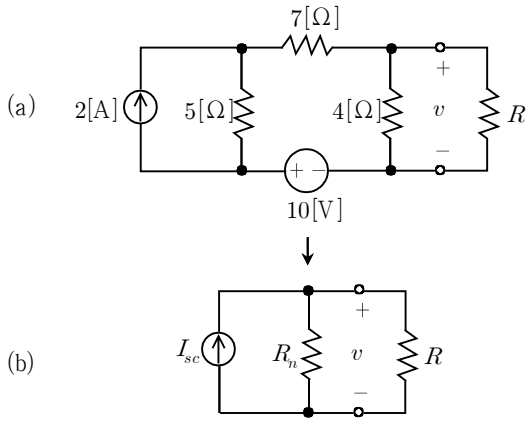
③ $L=2,\ C=0.05$ ④ $L=2,\ C=0.5$

문 5. 어떤 회로의 입력으로 단위 계단함수 $u(t)$[V]가 인가되었을 때 출력이 $10\cos(2t)u(t)$[V]가 되었다면, 이 회로의 전달함수 $H(s)$는?

① $H(s) = \frac{10s}{s^2+4}$ ② $H(s) = \frac{20s}{s^2+4}$

③ $H(s) = \frac{10s^2}{s^2+4}$ ④ $H(s) = \frac{20s^2}{s^2+4}$

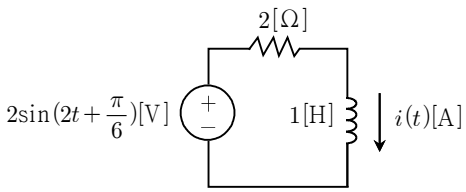
문 6. 다음 회로(a)에 대한 노턴(Norton) 등가회로(b)의 I_{sc}[A]와 R_n[Ω]의 값은?



① $I_{sc} = \frac{5}{3},\ R_n = 3$ ② $I_{sc} = \frac{5}{3},\ R_n = 4$

③ $I_{sc} = \frac{7}{3},\ R_n = 3$ ④ $I_{sc} = \frac{7}{3},\ R_n = 4$

문 7. 다음 회로에서 $i(t)$[A]는?



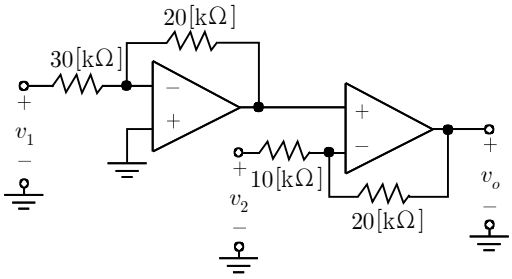
① $i(t) = \frac{1}{2}\sin(2t+\frac{\pi}{12})$

② $i(t) = \frac{1}{2}\sin(2t-\frac{\pi}{12})$

③ $i(t) = \frac{1}{\sqrt{2}}\sin(2t+\frac{\pi}{12})$

④ $i(t) = \frac{1}{\sqrt{2}}\sin(2t-\frac{\pi}{12})$

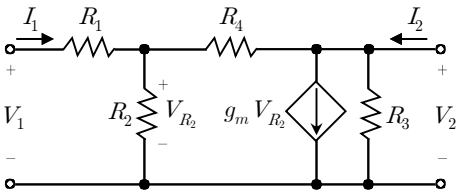
문 8. 다음 회로에서 v_1[V]과 v_2[V]로 출력전압 v_o[V]를 나타낸 것은? (단, 연산증폭기는 이상적이다)



① $-\frac{2}{3}v_1+2v_2$　② $-\frac{2}{3}v_1-2v_2$

③ $-2v_1-2v_2$　④ $-2v_1+2v_2$

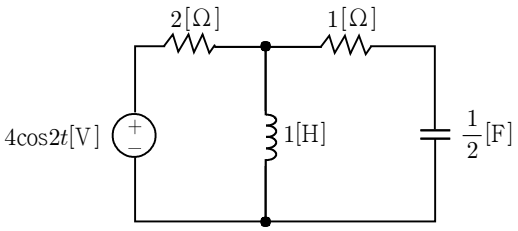
문 9. 다음 2단자망의 하이브리드 파라미터(h-파라미터) 중 h_{22}는?



① $R_3+\frac{g_mR_2}{R_2+R_4}$　② $R_3+\frac{g_mR_2+1}{R_2+R_4}$

③ $\frac{1}{R_3}+\frac{g_mR_2}{R_2+R_4}$　④ $\frac{1}{R_3}+\frac{g_mR_2+1}{R_2+R_4}$

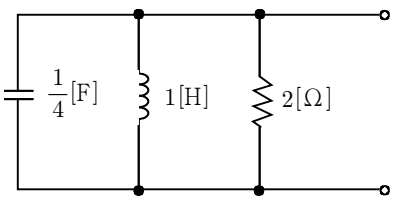
문 10. 다음 교류회로에서 전원으로부터 공급되는 평균전력[W]은?



① 1　② 2

③ 3　④ 4

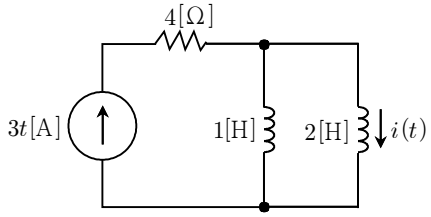
문 11. 다음 회로에서 각주파수가 $\omega=2$[rad/s]일 때 등가 임피던스[Ω]는?



① $\frac{1}{2}$　② 2

③ $\frac{1}{2}+j2$　④ $2+j\frac{1}{2}$

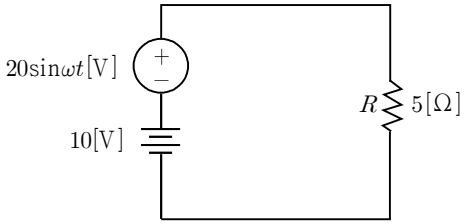
문 12. 다음 회로에서 $i(0-)=0$일 때, $t>0$에서 $i(t)$[A]는?



① t　② $2t$

③ $\frac{1}{3}t$　④ $\frac{2}{3}t$

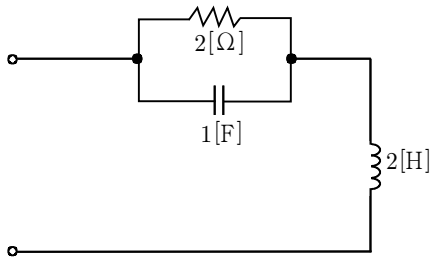
문 13. 다음 회로와 같이 직류 전압원과 교류 전압원이 직렬로 연결된 경우, 저항 R에 전달되는 평균전력[W]은?



① 60　② 80

③ 100　④ 120

문 14. 다음 회로의 임피던스에 대한 s평면상의 극점(p)과 영점(z_1, z_2)으로 옳은 것은?



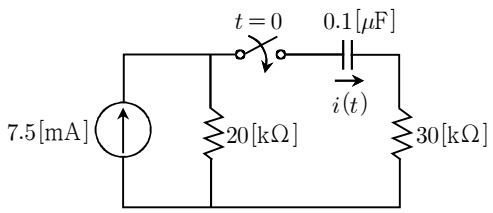
① $p=-\frac{1}{4},\ z_1, z_2=-\frac{1}{4}\pm j\frac{\sqrt{7}}{4}$

② $p=-\frac{1}{4},\ z_1, z_2=-\frac{1}{2}\pm j\frac{\sqrt{7}}{2}$

③ $p=-\frac{1}{2},\ z_1, z_2=-\frac{1}{4}\pm j\frac{\sqrt{7}}{4}$

④ $p=-\frac{1}{2},\ z_1, z_2=-\frac{1}{2}\pm j\frac{\sqrt{7}}{2}$

문 15. 다음 회로에서 스위치가 오랜 시간 동안 열려 있었고 커패시터의 초기 전하는 0이라고 가정한다면, $t=0$에서 스위치가 닫혔을 때 $t>0$에서 $i(t)$[mA]는?



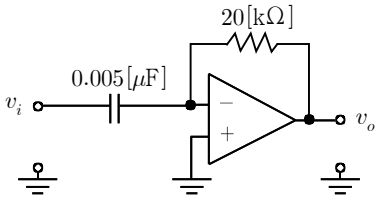
① $3e^{-100t}$

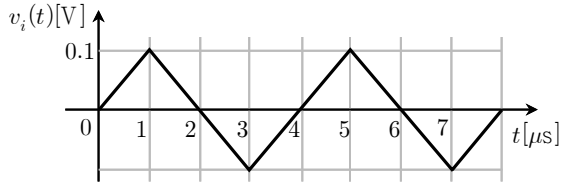
② $3e^{-200t}$

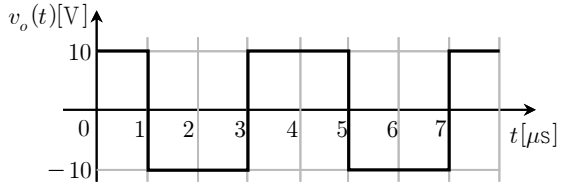
③ $5e^{-100t}$

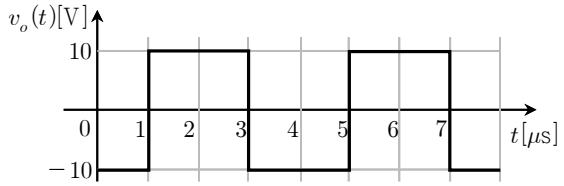
④ $5e^{-200t}$

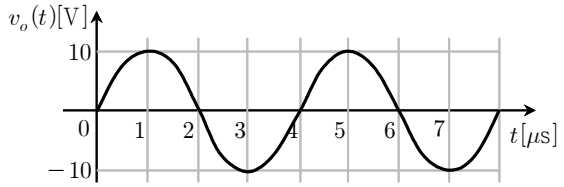
문 16. 다음 회로의 입력전압(v_i)이 그림과 같은 삼각파일 때 출력전압(v_o)은? (단, 연산증폭기는 이상적이다)

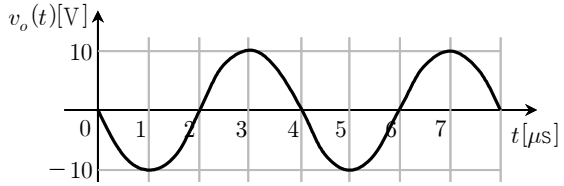




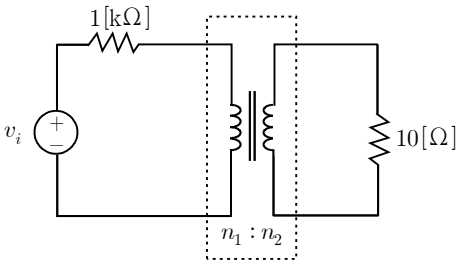
①


②


③


④


문 17. 다음 회로에서 부하에 최대전력을 공급하는 권선비($n_1 : n_2$)와 이때 부하(10[Ω])에서 소비되는 평균전력 P[W]를 구한 것으로 옳은 것은? (단, v_i는 rms 값이고 변압기는 이상적이다)



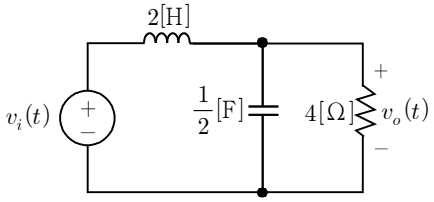
① $n_1 : n_2 = 10 : 1,\ P = \dfrac{v_i^2}{2000}$

② $n_1 : n_2 = 10 : 1,\ P = \dfrac{v_i^2}{4000}$

③ $n_1 : n_2 = 1 : 10,\ P = \dfrac{v_i^2}{2000}$

④ $n_1 : n_2 = 1 : 10,\ P = \dfrac{v_i^2}{4000}$

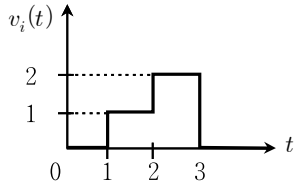
문 18. 다음 회로에서 입력전압 $v_i(t)$에 대한 출력전압 $v_o(t)$의 전달함수 $H(s)$는?

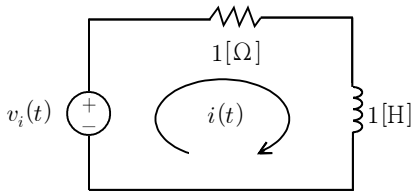


① $H(s) = \dfrac{2}{s^2+2s+4}$　　② $H(s) = \dfrac{4}{s^2+2s+4}$

③ $H(s) = \dfrac{2}{2s^2+s+2}$　　④ $H(s) = \dfrac{4}{2s^2+s+2}$

문 19. 다음 회로에서 라플라스 변환된 전류 $I(s)$는?





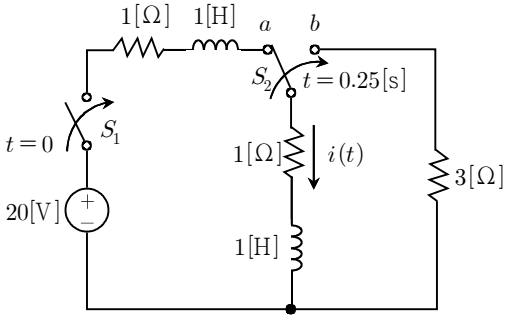
① $I(s) = (\dfrac{1}{s} + \dfrac{1}{s+1})(e^{-s} + e^{-2s} - 2e^{-3s})$

② $I(s) = (\dfrac{1}{s} - \dfrac{1}{s+1})(e^{-s} + e^{-2s} - 2e^{-3s})$

③ $I(s) = (\dfrac{1}{s} + \dfrac{1}{s+1})(e^{-s} + e^{-2s} + 2e^{-3s})$

④ $I(s) = (\dfrac{1}{s} - \dfrac{1}{s+1})(e^{-s} + e^{-2s} + 2e^{-3s})$

문 20. 다음 회로에서 $t<0$일 때 스위치 S_1은 열려 있고 S_2가 단자 a에 있다. $t=0$일 때 스위치 S_1을 닫고 0.25[s] 후 스위치 S_2를 단자 b로 옮겼다. $t>0.25$[s]에서 $i(t)$[A]는? (단, 모든 인덕터의 초깃값은 0이다)



① $10(e+e^{-0.75})e^{-\frac{t}{4}}$

② $10(e+e^{0.75})e^{-\frac{t}{4}}$

③ $10(e-e^{-0.75})e^{-4t}$

④ $10(e-e^{0.75})e^{-4t}$