

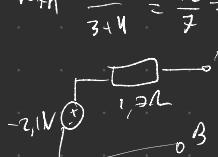


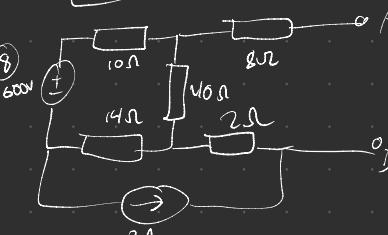
5) 

$$I_{R_4} = 2 \cdot \frac{U}{R_4} = 2 \cdot \frac{8}{2} = 8 \text{ A}$$

$$V = \frac{8}{2} \cdot 3 = 34 \text{ V}$$

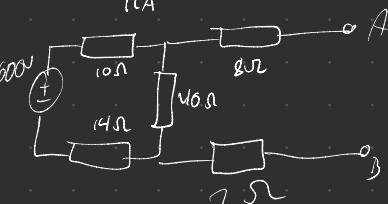
$$R_{\text{eq}} = \frac{3 \cdot 4}{3+4} = \frac{12}{7} = 1,7 \Omega$$

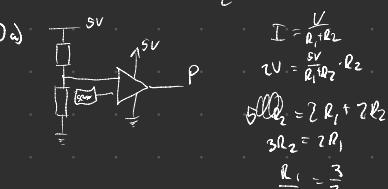


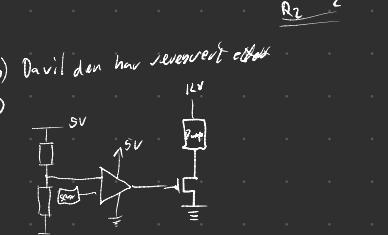
6) 

Superposition: 

$$R_{\text{eq}} = 2 \Omega + \frac{24 \cdot 40}{24+40} + 8 = 25 \Omega$$

7) 

8) 

9) 

a) $I = \frac{V}{R_1 + R_2}$

$$2V = \frac{5V}{R_1 + R_2} \cdot R_2$$

$$5R_2 = 2R_1 + 2R_2$$

$$3R_2 = 2R_1$$

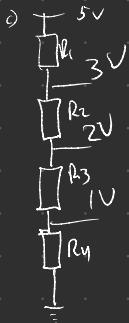
$$\frac{R_1}{R_2} = \frac{3}{2}$$

b) 

c) 

10) a) $V_1 = 1V$
 $V_2 = 2V$
 $V_3 = 3V$

b) $V_5 = \begin{vmatrix} C_1 & C_2 & C_3 & | & B_1 & B_2 & | & C_5 \\ 1 & 1 & 0 & | & 0 & 0 & | & 0 \\ 0 & 1 & 0 & | & 0 & 1 & | & 0 \\ 1 & 0 & 0 & | & 0 & 0 & | & 0 \\ 2 & 0 & 0 & | & 0 & 0 & | & 0 \\ 0 & 0 & 0 & | & 1 & 1 & | & 0 \end{vmatrix}$



$$I = \frac{5V}{50\text{ m}A} = 0,1 \text{ mA}$$

$$R_1 = \frac{2}{0,1 \text{ mA}} = 20000 \Omega$$

$$R_2 = 10000 \Omega$$

$$R_3 = 10000 \Omega$$

$$R_4 = 10000 \Omega$$

d)

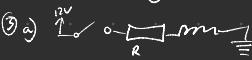
V_0	$L_1 L_0$	$B_1 B_0$	LGS
$0,21$	$1 1 0$	$0 0 0$	$0,01$
$1,22$	$1 0 0$	$0 1 0$	$0,01$
$2,23$	$0 0 0$	$1 1 0$	$0,01$
$3,24$	$0 0 0$	$1 1 1$	$0,01$

$$B_1 = L_2 \bar{L}_1 \bar{L}_0 + \bar{L}_2 \bar{L}_1 \bar{L}_0 = \bar{L}_1 \bar{L}_0$$

$$B_0 = L_2 L_1 L_0 + \bar{L}_2 \bar{L}_1 \bar{L}_0 = \bar{L}_0 (L_2 \oplus L_1)$$

$$B_1 = \begin{array}{c} L_1 - \infty \\ \hline L_0 - \infty \end{array} D \quad B_1$$

$$B_0 = \begin{array}{c} L_2 \rightarrow \\ L_1 \rightarrow \\ \hline L_0 \rightarrow \end{array} D \quad B_0$$



$$i(0) = 0$$

$$i(\infty) = \frac{12}{20} = 0,6 \text{ A}$$

$$i(t) = 0,6 - 0,6 e^{-\frac{t}{20}}$$

$$b) v_t(t) = \frac{0,6 - 0,6 e^{-\frac{t}{20}}}{20}$$

c)

① a) $w = k \cdot v$

$$I = \frac{12V}{20\Omega} = 0,6 \text{ A}$$

$$w = k \cdot I \cdot R = 10 \cdot 0,6 \cdot 15 = 90$$

6)

$$I = \frac{12}{10+R_2} \Rightarrow R_2 = \frac{12}{0,1} - 20 = \underline{\underline{34,5 \Omega}}$$

$$I = \frac{12}{10+R_m} \Rightarrow R_m = \frac{12}{0,1} - 10 = \underline{\underline{110 \Omega}}$$

$$I = \frac{12}{10+R_m} = \frac{12}{10+110} = 0,11 \text{ A}$$

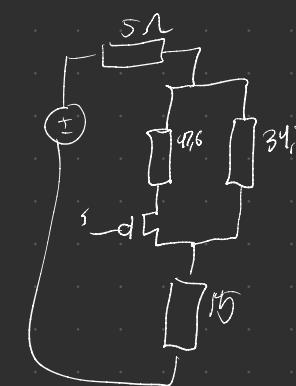
$$\hookrightarrow I = \frac{45}{10+5} = 0,3$$

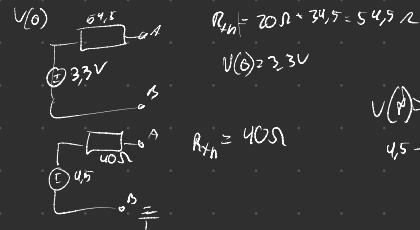
$$R_S = \frac{12}{0,3} - 20 \approx 20 \Omega$$

$$\frac{34,5 \cdot R_2}{34,5 + R_2} = 20$$

$$34,5 R_2 = 20 \cdot 34,5 \cdot 20 \Omega$$

$$R_2 = \frac{20 \cdot 34,5}{34,5} = 47,6 \Omega$$





$$V_{out} = 4.5 + (3.3 - 4.5)e^{-\frac{t}{40}}$$

$$4.5 - 1.2e^{-\frac{t}{40}} = 4$$

$$e^{-\frac{t}{40}} = \frac{1}{1.2}$$

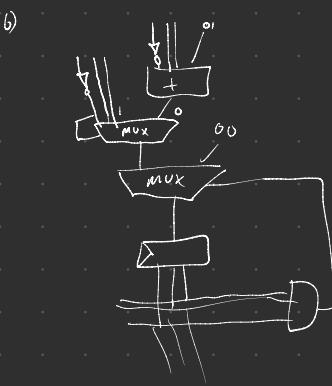
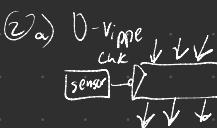
$$t = -\frac{1}{0.025} = 0.025s$$

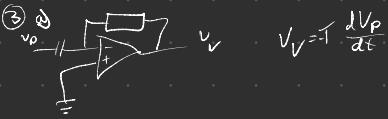
c)

 $V_A = V_o \left(1 + \frac{R_f}{R_L}\right)$
 $\left(1 + \frac{R_f}{R_L}\right) = 10$
 $\frac{R_f}{R_L} = 9$
 $R_f = 9R_L$
 $R_L = 1000\Omega$
 $R_f = 9000\Omega$

3)

 $P = -\frac{1}{R} \int_0^T \left(V_o \cos(4\pi ft) \right)^2 dt$
 $P = \frac{V_o^2}{2R} \int_0^T 1 + \cos(8\pi ft) dt$
 $P = \frac{V_o^2}{2R} \left[t + \sin(4\pi ft) \right]_0^T$
 $P = \frac{V_o^2 T}{2R} \left(T + \sin(4\pi fT) - (0 + \sin(0)) \right)$
 $P = \frac{V_o^2 T}{2R} = \frac{V_o^2}{2R} = \frac{(0.3\text{V})^2}{2 \cdot 500\Omega} = 9mW$





b)

(1) a) $V_{rms} = \frac{V_0}{\sqrt{2}} = \frac{325}{\sqrt{2}} = 230V$

b) $P = U \cdot I = 230V \cdot 10A = 2300W$



$I(0) = \frac{60}{230} = 0.784$

$P = U^2 / R$

$I(0) = 0$

$I(t) = 0.78 e^{-\frac{245t}{L}}$

$0.78 e^{-\frac{245 \cdot 3}{L}} = 0.05$

$L = \frac{245 \cdot 3}{\ln(0.05)} = 322H$

d) $P = \frac{1}{2} L I^2 = \frac{1}{2} L (I_3 - I_0)^2 = \frac{1}{2} \cdot 322 \cdot ((0.05)^2 - (0.78)^2) = -98J$



(2) a) $C_0 = 00000$

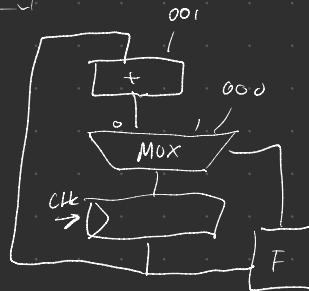
CLK



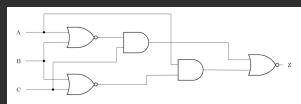
b) Help

$J0_{10} = 01010 = \bar{T}_4 \bar{T}_3 \bar{T}_2 \bar{T}_1 \bar{T}_0$

$J1_{10} = 00111 = \bar{T}_4 \bar{T}_3 \bar{T}_2 T_1 \bar{T}_0$



(2) c)



$$b) Z = \overline{A}\overline{B}C + A\overline{B}\overline{C}$$

$$Z = \overline{A}\overline{B}C \cdot \overline{A}\overline{B}\overline{C}$$

$$Z = (A+B+C) \cdot (\overline{A}+\overline{B}+C)$$

$$Z = A\overline{A} + AB + AC + B\overline{A} + BC + \overline{C}A + \overline{C}B + \overline{C}C$$

$$Z = AB + AC + B\overline{A} + BC + \overline{C}A + \overline{C}B$$

$$Z = B + AC + \overline{C}A$$

A	B	C	Z
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1



A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

$$\overline{F} = \overline{\overline{A}\overline{B}} = \overline{A} + \overline{B}$$

$$(8) D = \overline{ABC} + \overline{ABC} + A\overline{BC}$$

$$a) P = \frac{U^2}{R} \Rightarrow R = \frac{U^2}{P} = \frac{(10V)^2}{0.1} = 1000\Omega$$

$$b) P = \frac{12^2}{500} = 0.288 \quad \text{Parallel} \quad P = (23 \cdot 10)^2 / 500 = 0.264W$$

$$c) R_{\text{tot}} = 500 : 20 = 10\,000\Omega \quad I = \frac{230}{10\,000} = 23mA$$

$$d) \quad \begin{array}{l} \text{Circuit diagram: } 12V \text{ DC source, resistor } R_1, \text{ switch } S, \text{ resistor } R_2, \text{ and a parallel branch with } R_3. \\ \text{Equation: } R_1 I = 2V \\ \text{Calculation: } I^2 \cdot R_2 = 0.1 \\ I^2 = \sqrt{\frac{0.1}{500}} = 20mA \end{array}$$