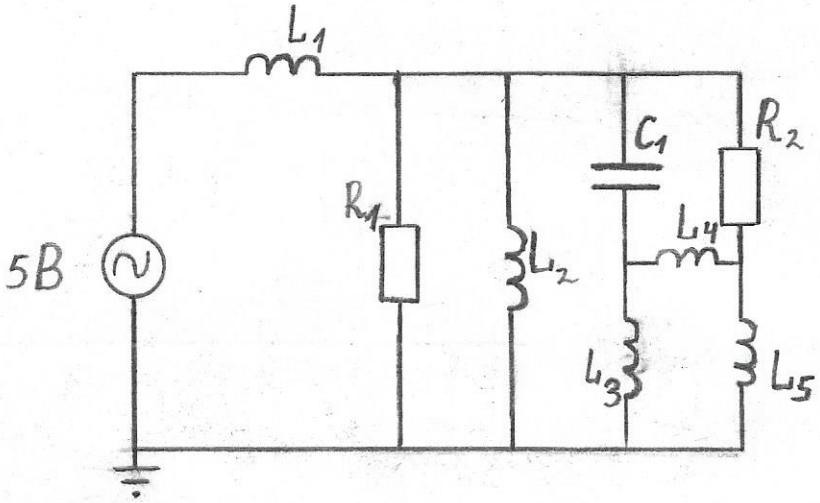
Зинченко Яков
Расчетное задание

вариант № 152528351035 2

$J = 53 \cdot 10^3$ Гц $\omega = 2\pi J$

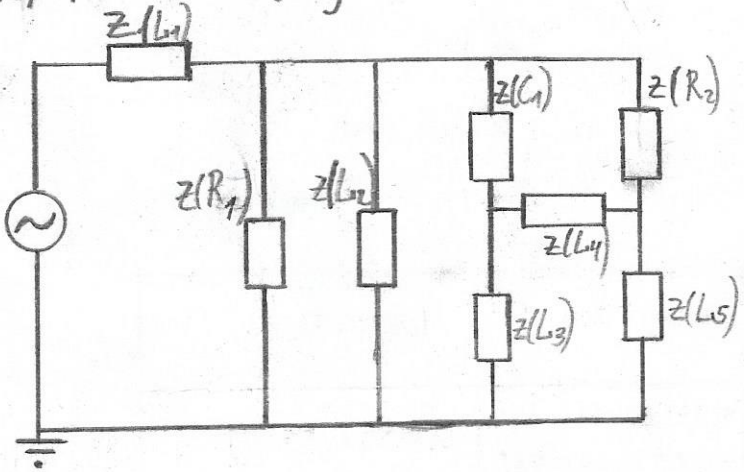
$U = 5$ В



$L_1 = 298 \cdot 10^{-3}$ Гн
$R_1 = 180 \cdot 10^3$ Ом
$L_2 = 420 \cdot 10^{-3}$ Гн
$C_1 = 363 \cdot 10^{-6}$ Ф
$L_3 = 180 \cdot 10^{-3}$ Гн
$L_4 = 294 \cdot 10^{-3}$ Гн
$R_2 = 102 \cdot 10^3$ Ом
$L_5 = 269 \cdot 10^{-3}$ Гн

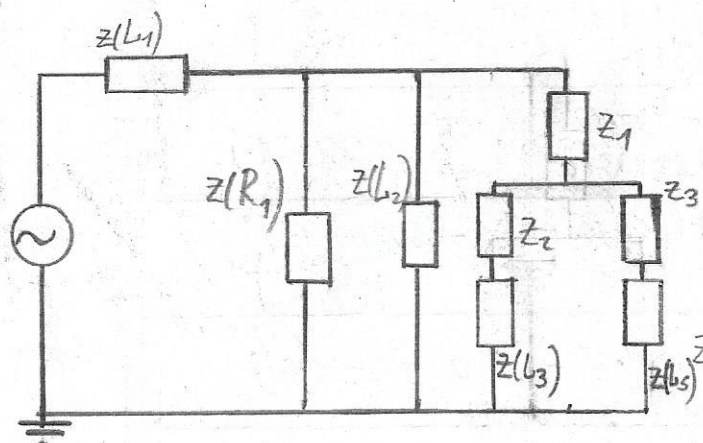
1) $Z(R) = R$ $Z(C) = \frac{1}{j\omega C}$ $Z(L) = j\omega L$

$\omega = 106\pi J \cdot 10^3$ с$^{-1}$



$Z(L_1) = j31588\pi J$ Ом
$Z(R_1) = 180 \times 10^3$ Ом
$Z(L_2) = j44520\pi J$ Ом
$Z(C_1) = \frac{1}{j38,478\pi J}$ Ом
$Z(L_3) = j19080\pi J$ Ом
$Z(L_4) = j31164\pi J$ Ом
$Z(R_2) = 102 \cdot 10^3$ Ом
$Z(L_5) = j28514\pi J$ Ом

2)



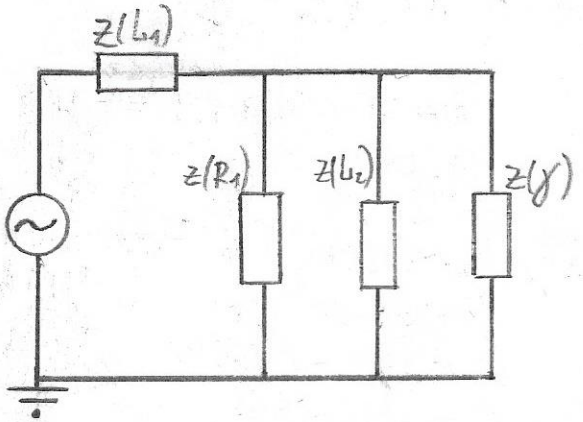
$Z_1 = \frac{Z(C_1) \cdot Z(R_2)}{Z(C_1) + Z(R_2) + Z(L_4)}$

$Z_2 = \frac{Z(C_1) \cdot Z(L_4)}{Z(C_1) + Z(R_2) + Z(L_4)}$

$Z_3 = \frac{Z(R_2) \cdot Z(L_4)}{Z(C_1) + Z(R_2) + Z(L_4)}$

$Z_1 = -0,00413279 - 0,00430566i$
$Z_2 = 0,00413279 - 0,00396685i$
$Z_3 = 48911,2 + 50957,2i$

3)

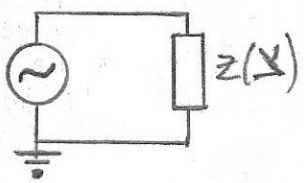


$$Z(y) = z_1 + \frac{(z_2 + z(L_3))(z_3 + z_5(L_5))}{z_3 + z_2 + z(L_5) + z(L_3)}$$

$$z(y) = 4126,87 + 43026,3i$$

$$z(\beta) = \frac{z(L_2)z(y)}{z(L_2) + z(y)}$$

4)



$$z(x) = z(L_4) + \frac{z(R_1)z(L_2)z(y)}{z(L_2)z(y) + z(R_1)z(y) + z(R_1)z(L_2)}$$

$$z(x) = 7995,59 + 130315i$$

$$I_0 = \frac{U}{z(x)} \qquad I(L_4) = I_0$$

$$I_0 = 2,34532 \cdot 10^{-6} - 0,00003822 48i$$

$$I(R_1) = \frac{I(L_4)}{\frac{z(R_1)}{z(\beta)} + 1}$$

$$I(z_1) = I(\beta) - I(L_2)$$

$$I(z_2) = \frac{I(y)}{\frac{z_3 + z(L_5)}{z(L_2)} + 1}$$

$$I(z_3) = I(y) - I(z_2)$$

$$\varphi_1 = z(y) I(y) \qquad U(C_1) = \varphi_1 - \varphi_2$$

$$\varphi_2 = z(L_3) I(L_3) \qquad U(R_2) = \varphi_1 - \varphi_3$$

$$\varphi_3 = z(L_5) I(L_5) \qquad U(L_4) = \varphi_3 - \varphi_2$$

$$I(C_1) = \frac{U(C_1)}{z(C_1)}$$

$$I(R_2) = \frac{U(R_2)}{z(R_2)}$$

$$I(L_4) = \frac{U(L_4)}{z(L_4)}$$

$$I_0 = I(R_1) + I(L_2) + I(L_3) + I(L_5)$$

$$P = UI$$

Элемент	Номинал	Напряжение	Сила тока	Мощность
L_1	298 мГн	$3,7933 + 0,232742j$	$2,34532 \cdot 10^{-6} - 0,00003822 48j$	$0,00014554 4j$
R_1	180 кОм	$1,2067 - 0,232742j$	$6,70389 \cdot 10^{-6} - 1,29301 \cdot 10^{-6}j$	$8,39053 \cdot 10^{-6}$
L_2	420 мГн	$1,2067 - 0,232742j$	$-1,66406 \cdot 10^{-6} - 8,62769 \cdot 10^{-6}j$	$0,00001079 83j$
C_1	363 мкФ	$-2,06637 \cdot 10^{-7} + 6,07807 \cdot 10^{-8}j$	$-7,3473 \cdot 10^{-6} - 0,00002499 87j$	$-5,60809 \cdot 10^{-12}j$
L_3	180 мГн	$1,207 - 0,232742j$	$-3,88281 \cdot 10^{-6} - 0,00002013 13j$	$0,00002519 61j$
L_4	294 мГн	$-0,474585 + 0,33919j$	$3,46449 \cdot 10^{-6} + 4,84743 \cdot 10^{-6}j$	$-2,11758 \cdot 10^{-22} + 3,47564 \cdot 10^{-6}j$
R_2	102 кОм	$0,474585 - 0,33918 9j$	$4,6528 \cdot 10^{-6} - 3,32539 \cdot 10^{-6}j$	$3,33608 \cdot 10^{-6}$
L_5	269 мГн	$0,732115 + 0,106448j$	$1,1883 \cdot 10^{-6} - 8,17281 \cdot 10^{-6}j$	$6,10994 \cdot 10^{-6}j$