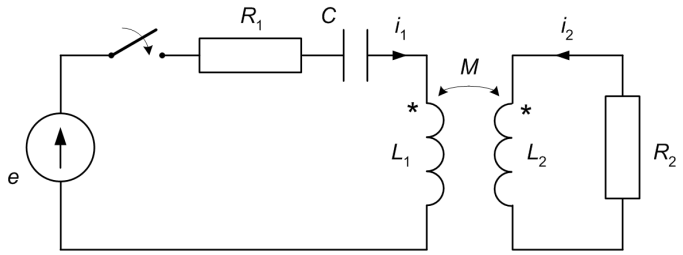
Circuit diagram



State-space equations, assuming that $\mathbf{x}=[i_1, i_2, u_C]^T$

$$\frac{d\mathbf{x}}{dt} = \begin{bmatrix} -\frac{R_1 D L_2}{M} & \frac{R_2 D L_2}{L_2} & -\frac{D L_2}{M} \\ R_1 D & -\frac{R_2 D L_1}{M} & D \\ \frac{1}{C} & 0 & 0 \end{bmatrix} \mathbf{x} + \begin{bmatrix} \frac{D L_2}{M} \\ -D \\ 0 \end{bmatrix} e \qquad D = \frac{M}{L_1 L_2 - M^2}.$$

Main program:

```
clear all;
x0= [ 0
      0
      0 ];
t0= 0;
tf= 1;
[t,x]=ode45( 'rlc', [t0, tf], x0 );
subplot(2,1,1);
plot( t, x(:,1), 'r-', t, x(:,2), '--' ); grid
title('Transient state currents');
legend('i1(t)','i2(t)');
subplot(2,1,2);
plot( t, x(:,3), 'g-' ); grid
legend('uc(t)');
title('Transient state voltage');
```

Function file:

```
function xprim= rlc(t,x)
R1= 0.02; R2= 0.5; C= 0.01; L1= 1; L2= 1.5; M= 1;
e=sin(314*t);
D=M/(L1*L2-M^2);
A= [ -R1*L2*D/M  R2*D       -L2*D/M
     R1*D       -R2*L1*D/M   D
     1/C         0           0      ];
B= [  L2*D/M
     -D
      0 ];
xprim= A*x+B*e;
```