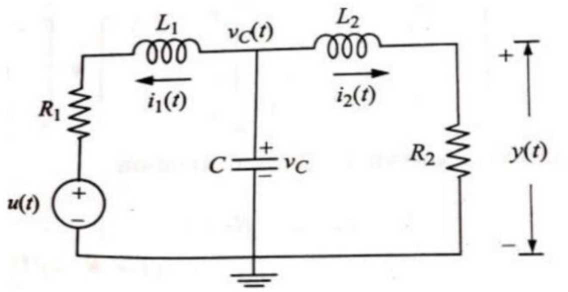
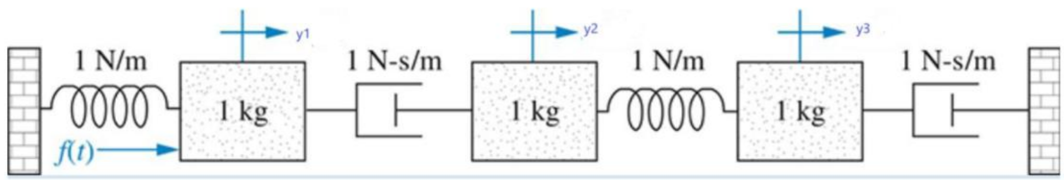
SHEET 1 state space representation

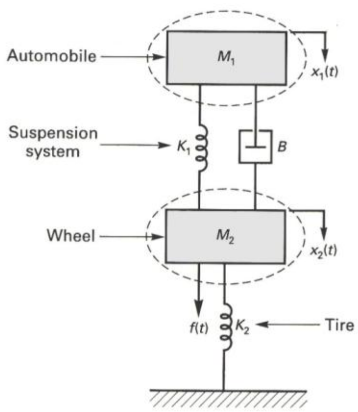
Q1\ Draw the block diagrams representing the following systems.



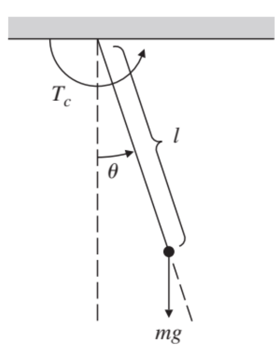
- $x_1 = i_1$ (Current through inductor L_1)
- $x_2 = i_2$ (Current through inductor L_2)
- $x_3 = v_C$ (Voltage across the capacitor C)



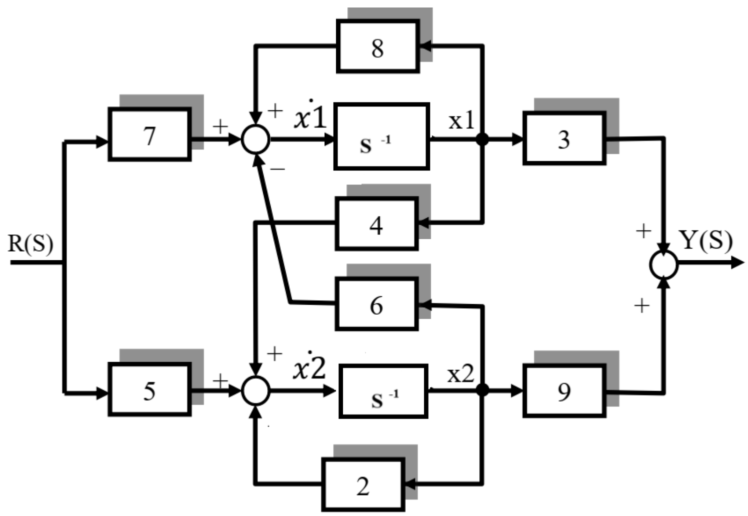
Q2 Drive the state representation of the following system.



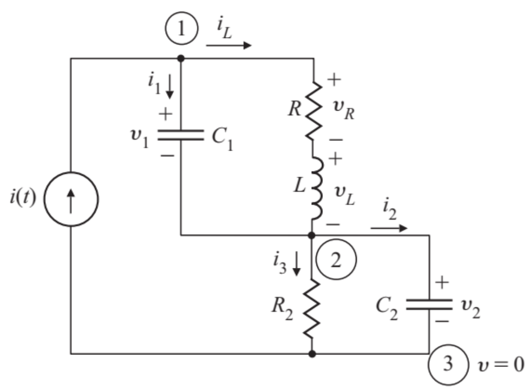
Q3 drive the state space model of the pendulum in the following figure, where the applied torque is T_c.



Q4\ Drive the state space representation of the following block diagram



Q5\ find the state space model of the following system:



Q6\ formulate the state space model for the system described by the following D.E:

$$\dddot{y} + 7\ddot{y} + 14\dot{y} + 8y = r$$

Take the state variables as:

$$x1 = y + \dot{y}$$

$$x2 = \dot{y} + \ddot{y}$$

$$x3 = y$$

Q7\ formulate the state space model for the system described by the following D.E:

$$\dddot{y} + 2\ddot{y} + 5\dot{y} + y = 3\dot{r} + r$$

Q8

A linear multivariable system is described by the following differential equations:

$$\frac{d^2c_1(t)}{dt^2}+\frac{dc_1(t)}{dt}+2c_1(t)-2c_2(t)=r_1(t)$$

$$\frac{d^2c_2(t)}{dt^2}+c_2(t)-c_1(t)=r_2(t)$$

a) Write the state equation and output equation in matrix form,
b) Draw the block diagram representing this system.

Q9

Using Direct Decomposition, find the dynamic equation of the following systems:

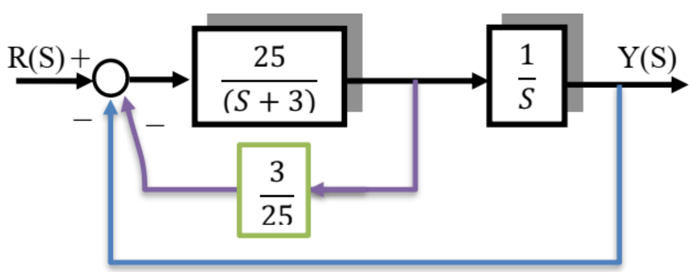
$$\frac{d^2c(t)}{dt^2}+2\frac{dc(t)}{dt}+c(t)+\int c(t)=r(t)$$

$$\frac{d^3c(t)}{dt^3}+6\frac{dc(t)}{dt}+5c(t)=5e(t)$$

$$\frac{C(s)}{R(s)}=\frac{2S^2+8S+2}{S^3+6S^2+12S+10}$$

$$\frac{Y(s)}{U(s)}=\frac{10(S+3)}{(S+4)^3(S+5)}$$

Q10 find the dynamic equation of the following block diagram:



Q11 Draw the block diagram of the DC motor