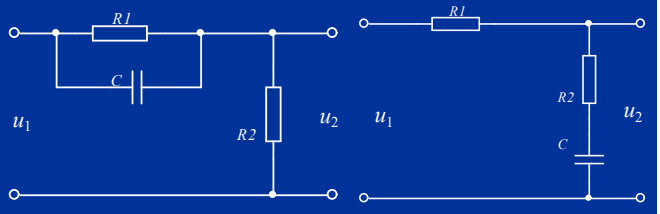
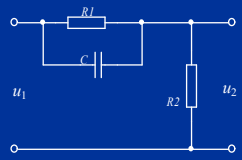
1、图中各电路，u1为输入量，u2为输出量，试写出动态方程。



(1)　　(2)

(1)解答：



$$u_1(t)=u_{R1}(t)+u_{R2}(t)=u_{R1}(t)+u_2(t)$$

$$i_1(t)=\frac{u_{R1}(t)}{R_1}=\frac{u_1(t)-u_2(t)}{R_1}$$

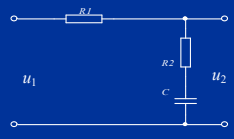
$$i_2(t)=C\frac{du_C(t)}{dt}=C\cdot\left(\frac{du_1(t)}{dt}-\frac{du_2(t)}{dt}\right)$$

$$u_2(t)=R_2\cdot(i_1(t)+i_2(t))=R_2\frac{u_1(t)-u_2(t)}{R_1}+R_2C\cdot\left(\frac{du_1(t)}{dt}-\frac{du_2(t)}{dt}\right)$$

$$R_1\cdot u_2(t)=R_2u_1(t)-R_2u_2(t)+R_1R_2C\cdot\frac{du_1(t)}{dt}-R_1R_2C\cdot\frac{du_2(t)}{dt}$$

$$R_1R_2C\cdot\frac{du_2(t)}{dt}+(R_1+R_2)\cdot u_2(t)=R_1R_2C\cdot\frac{du_1(t)}{dt}+R_2u_1(t)$$

(2)解答：



$$i(t)=\frac{u_1(t)-u_2(t)}{R_1}$$

$$i(t)=C\frac{du_C(t)}{dt}=C\frac{d[u_2(t)-R_2i(t)]}{dt}=C\frac{du_2(t)}{dt}-R_2C\frac{di(t)}{dt}$$

$$\frac{u_1(t)-u_2(t)}{R_1}=C\frac{du_2(t)}{dt}-\frac{R_2C}{R_1}\cdot\left(\frac{du_1(t)}{dt}-\frac{du_2(t)}{dt}\right)$$

$$(R_1+R_2)C\frac{du_2(t)}{dt}+u_2(t)=R_2C\frac{du_1(t)}{dt}+u_1(t)$$

2、求下面象函数$F(s)$的原函数$f(t)$

$$F(s)=\frac{s^2+5s+5}{s^2+4s+3}$$

解答：

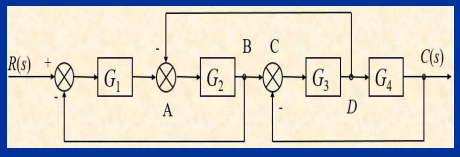
$$\because\ F(s)=\frac{s^2+5s+5}{s^2+4s+3}=1+\frac{s+2}{s^2+4s+3}$$

$$=1+\frac{s+2}{(s+3)(s+1)}=1+\frac{1/2}{s+1}+\frac{1/2}{s+3}$$

$$\therefore f(t)=\delta(t)+\frac{1}{2}e^{-t}+\frac{1}{2}e^{-3t}$$

3、求以下系统的闭环传递函数C(s)/R(s)

（1）

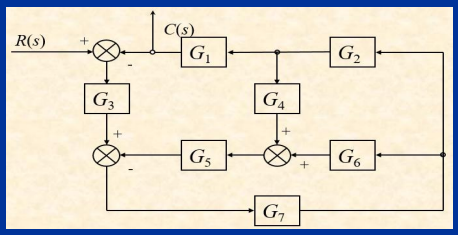


(1)解答：

$$\frac{C(s)}{R(s)}=\frac{G_1G_2G_3G_4}{1+G_1G_2+G_3G_4+G_2G_3+G_1G_2G_3G_4}$$

3、求以下系统的闭环传递函数C(s)/R(s)

（2）

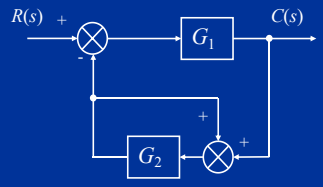


(2)解答：

$$\frac{C(s)}{R(s)}=\frac{G_1G_2G_3G_7}{1+G_5G_6G_7+G_2G_4G_5G_7+G_1G_2G_3G_7}$$

3、求以下系统的闭环传递函数C(s)/R(s)

（3）

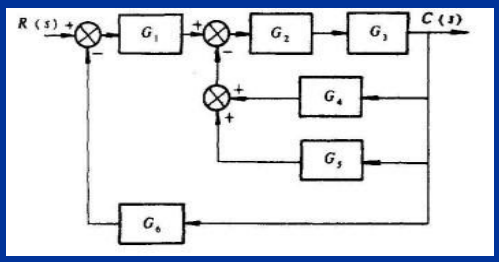


(3)解答：

$$\frac{C(s)}{R(s)}=\frac{G_1(1-G_2)}{1-G_2+G_1G_2}$$

3、求以下系统的闭环传递函数C(s)/R(s)

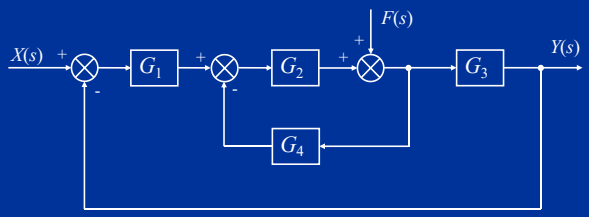
（4）



(4)解答：

$$\frac{C(S)}{R(S)}=\frac{G1G2G3}{1+G2G3G4+G2G3G5+G1G2G3G6}$$

4、求图示系统的Y(s)/X(s)及Y(s)/F(s)



解答：

$$\frac{Y(s)}{X(s)}=\frac{G_1G_2G_3}{1+G_2G_4+G_1G_2G_3}$$

$$\frac{Y(s)}{F(s)}=\frac{G_3}{1+G_2G_4+G_1G_2G_3}$$