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%---------------------- Matlab command window – commands to be entered :
%-------------------- (for the first four questions from Matlab tutorial sheet and block diagram reduction (Tut1 %-
%                                                  ----------------- problem a)

clc;
clear all;

%---------------------- for differential equation solution----------

syms x
x= dsolve ('D2x=-5*Dx-3*x+7', 'x(0)=0', 'Dx(0)=1')

%---------------------- residues poles ----------

% for residues poles pf expansion: inverse Laplace transform
 syms s
 num = [5 7 8 30];
 den = [1 15 62 85 25];
 [r,p,k]=residue(num,den)

% ----------------for laplace transform---------------------------

 syms t u
 f=7*heaviside(t)+5*exp(-3*t);
 F=laplace(f)
 pretty (F)
```

```
% ------------------for inverse laplace transform----------------------
syms s t u
F=7/(s^2+3*s+2);
%F=5/(s + 3) + (7*u)/s^2;
f=ilaplace(F)

%----------------------pole zero plot from tf-------------------------

num = [5 7 8 30];
den = [1 15 62 85 25];
sys=tf(num,den)
p=pole(sys)
z=zero(sys)
pzmap(sys)
[z,p,k] = tf2zp(num,den)

%-------------------- tf  from pole zero----------------------------

z = [1 0]';   %should be a column vector
%p = roots([1 0.01 1]);
p=[3 4];
k = 10;
[num,den] = zp2tf(z,p,k)
sys=tf(num,den)
pzmap(sys)
```

```
%-------------------- block diagram reduction ----------------------------
%-------------------- ( for Tut 1 problem (a)  )----------------------------
clc;
syms g1 g2 g3 g4 h1 h2 h3;
 M=[  1   0   0   0   0  -h1   0   0    0   0   0;

       1   1   0   0   0   0   0   0    0   0   -1;

      0  -g1  1   0   0   0    0   0    0   0   0;

      0   0   0   1   0   0    0   0   -h3   0   0;

      0   0   -1  -1   1   0    0   0    0   0   0;

      0   0   0   0  -g2  1    0   0    0   0   0;

      0   0   0   0   0  -1    1   1    0   0   0;

      0   0   0   0   0   0    0   1    0  -h2  0;

      0   0   0   0   0   0   -g3   0   1   0   0;

      0   0   0   0   0   0    0    0  -g4   1   0 ];

 N=rref(M);
 Sol = - N(10,11)
```