Q1(b)

```
s = tf('s');
G = 50/(s*(s^2+10*s+50)*(s+5));
%G = prescale(ss(G));
Gd = 100/s;
[K1,CL,gamma,info] = loopsyn(G,Gd);
```

```
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  9.310850e-25.
Warning: Matrix is close to singular or badly scaled. Results may be inaccurate. RCOND =  5.288815e-23.
```

```
S = 1/(1+G*K1);
isstable(S)
```

```
ans = logical
   1
```

```
M = K1*S*G;
gam = norm(M,'inf')
```

```
gam = Inf
```

```
alpha = 1/gam
```

```
alpha = 0
```

Q1(c)

```
OPT = balredOptions('StateElimMethod','Truncate');

K2 = (2*(s^2+10*s+50)*(s+5))/((s^2)*(1+ s/1e4));

order(K1)
```

```
ans = 11
```

```
order(K2)
```

```
ans = 3
```

```

K1 = balred(K1,2,OPT); % Loopsyn
K2 = balred(K2,2,OPT); % By-hand

isstable(K1)
```

```
ans = logical
   0
```

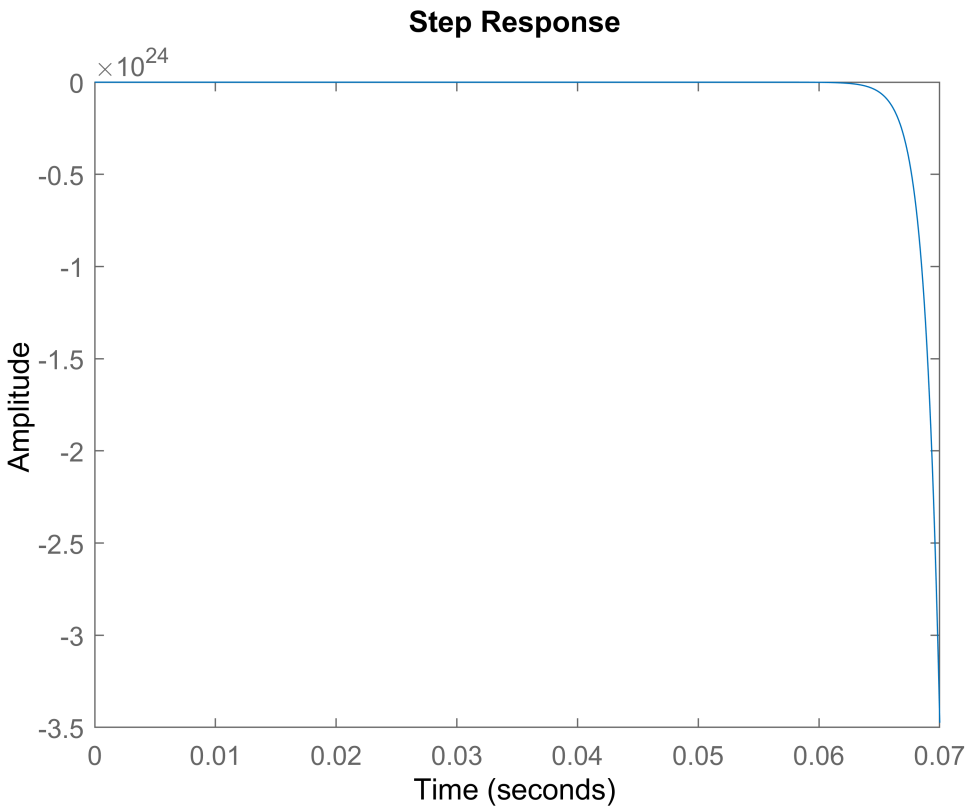
```
isstable(K2)
```

```
ans = logical
   1
```

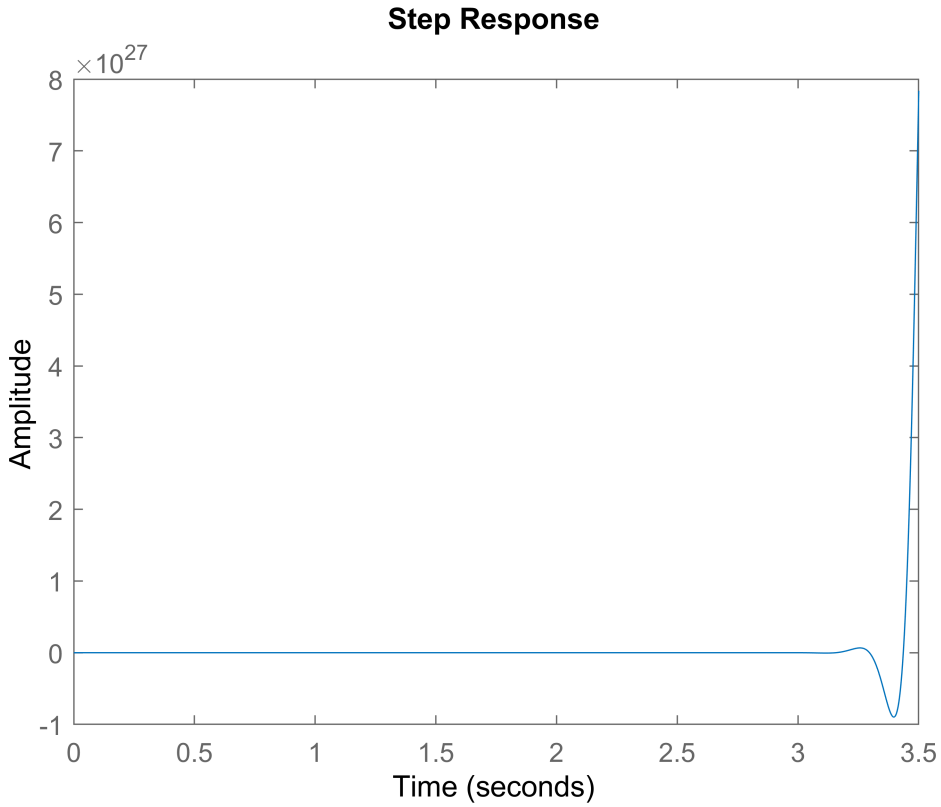
```

T1 = G*K1/(1 + G*K1);
T2 = G*K2/(1 + G*K2);
```

```
step(T1)
```




```
step(T2)
```



```
% Loopsyn controller
S = 1/(1+G*K1);
isstable(S)
```

```
ans = logical
   0
```

```
M = K1*S*G;
gam = norm(M,'inf')
```

```
gam = Inf
```

```
alpha = 1/gam
```

```
alpha = 0
```

```
% By-hand controller
S = 1/(1+G*K2);
isstable(S)
```

```
ans = logical
   0
```

```
M = K2*S*G;
gam = norm(M,'inf')
```

```
gam = 1.0025
```

```
alpha = 1/gam
```

```
alpha = 0.9975
```