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EXAM 2 MATLAB APPENDIX

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```
close all; clear; clc;
```

Problem 1

```
A = [1,0;0,2];
```

Problem 2

```
A = [1,1,1; 0,1,1;1,0,0];
```

```
[vec, vals] = eig(A);
```

```
syms a b c
```

```
B = [a;b;c];
```

```
B = [1;0;0];
```

```
C = [B A*B A^2*B];
```

```
B = [1;0;1];
```

```
K = [-2,3,5];
```

```
closedA = A - B*K;
```

```
[vec, vals] = eig(closedA);
```

Problem 3

```
A = [-5,3,5,2,-4,-1; 0.7,-1.55,0.65,8.6,-6.1,0.1; -0.7,0.55, -1.65, -0.6,  
0.1, -0.1;...
```

```
1.70,-1.05,-4.85,2.6,-1.1,1.1; 0, 0.5, 0.5, 4, -5, 0; -1.8, 1.2, 6.4,  
-4.4, 0.4, -3.4];
```

```
B = [1;1;1;2;2;0];
```

```
C = [1,2,0,0,0,0];  
D = 0;
```

```
[T, vals] = eig(A);
```

```
diag = inv(T)*A*T;  
Btild = inv(T)*B;  
Ctild = C*T;
```

Problem 4

```
A = [0,2,1; -1,0,1;3,-2,1;0,4,1;1,2,1];
```

```
LN = null(A');  
y = LN(:,1);
```

```
W = [A y];
```

```
A = [1,1,1,1,; 2,4,6,3; 0,2,4,1; 1,-1,-3,0];  
y = [5;25;15;-10];
```

```
Aug = [A y];  
Ared = A(1:2, :);  
yred = y(1:2);
```

```
xln = Ared'*inv(Ared*Ared')*yred;
```

```
RN = null(A);
```

```
x1 = xln + RN(:,1);  
x2 = xln + RN(:,2);
```

Problem 5

```
A = [0,1,0,0,0,0; 0,0,0,0,0,0; 0,0,0,1,0,0; 0,0,-1,-2,0,0; 0,0,0,0,0,1;  
0,0,1,2,-3,-4];  
B = [0;1;0;1;0;0];
```

```
[vec, vals] = eig(A);
```

```
Ctild = ctrb(A,B);  
P = [-1 -1.5 -1.75 -2 -2.1 -3];  
K = place(A,B,P);
```

```
Aclosed = A - B*K;
```

```
[vec2, val2] = eig(Aclosed);
```

Functions

```
function out = controllMat(A,B)
    [n,~] = size(B);
    out = B;
    for i = 1:n-1
        out = [out A^i*B];
    end
end
```

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